GEOTECHNICAL DESIGN REPORT
PROPOSED DIAZ ROAD EXPANSION PROJECT
(PW17-25)
CITY OF TEMECULA, CALIFORNIA

Prepared for

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Project No. 12502.001

July 6, 2020

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David Evans and Associates, Inc.
41951 Remington Avenue, Suite 200
Temecula, CA 92590

Attention: Mr. Gavin Powell, PE, Project Manager

Subject: Geotechnical Design Report
Proposed Diaz Road Expansion Project (PW17-25)
City of Temecula, California

In accordance with your request, we are pleased to present herewith the results of our geotechnical evaluation for the subject project. Based on the results of our evaluation and review, it is our opinion that the proposed roadway improvements are generally feasible from a geotechnical perspective provided the recommendations included in this report are implemented during design and construction phases. Please note that further testing and/or field verification should be performed to confirm the actual site/subgrade conditions exposed during construction and provide additional recommendations, when warranted.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

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Principal Engineer

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Senior Principal Geologist

Distribution: (1) Addressee (PDF)

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1.0 INTRODUCTION

1.1 Purpose and Scope of Work

The purpose of this report is to provide geotechnical recommendations for design and construction of the proposed improvements. Our scope of work included the following:

- A background review of readily available literature and relevant geotechnical reports pertinent to this area. Relevant documents reviewed are referenced at the end of this report.
- Obtaining an encroachment permit from City of Temecula to perform the field exploration/coring within the subject street right-of-way.
- A site reconnaissance and excavation of 8 exploratory borings within the area of new roadway and three percolation/infiltration tests located along the alignment. Approximate locations of these and previous borings are depicted on Figure 2. The logs of the borings are included in Appendix A.
- Geotechnical laboratory testing of selected soil samples collected during this exploration. The test results are presented in Appendix B.
- Geotechnical engineering analysis performed or as directed by a California registered Geotechnical Engineer (GE).
- Preparation of this report, presenting our findings, conclusions and geotechnical recommendations for earthwork construction.

1.2 Site Description / Existing Improvements

Diaz Road is an active arterial highway in the City of Temecula with 2 lanes in each direction, except for the middle portion generally located between Via Montezuma and Winchester Road, where existing Diaz Road has only two lanes (one lane in each direction). The limits of the proposed work begin just north of Rancho Road Station 17+50 (near EMWD Pump Station) and continue north to the future extension with Cherry Street (See Figure 1). Diaz Road currently terminates approximately 800-feet north of the intersection with Dendy Parkway at the entrance gate to the Rancho California Water District's (RCWD's) storage ponds. Eastern Municipal Water District (EMWD) and RCWD have numerous underground utility lines located along the east shoulder of the existing roadway. The northbound (east) shoulder along Murrieta Creek is currently landscaped along most of the alignment with mulch and a meandering multi-use trail. Drainage pipes/culverts currently cross Diaz Road at various locations and discharge into Murrieta Creek. The westbound is generally fully developed with existing curbs and sidewalks along most of the alignment.

1.3 Street Designation

For the purpose of pavement design and based on information provided, the traffic index for a 20-year design life for Diaz Road is 10 (TI=10).

1.4 Project Improvements

As depicted on the Preliminary Street Improvement Plans by David Evans and Associates (DEA, 2020), the proposed Diaz Road improvements within the project limits include the following:

- New Roadway: A new lane will be added to the northbound side of Diaz Road from approximate station 17+50 to approximate station 63+00. The new lane will tie-in with existing widened areas on the north and southern portions of the project. An existing dirt portion of Diaz Road between Dendy Parkway and Cherry Street (future) will also be paved/improved.
- New Curbed Center Median: In addition to the added travel lanes, an elevated curbed concrete center median will be constructed throughout the project alignment. The median will create turn pockets and crossings at intersections.
- Multi-use Trail Re-alignment: Portions of the new roadway will encroach into the existing multi-use trail. The trail will be re-aligned in these areas. Alternative trail alignments may be considered to reduce environmental impact, utility conflicts and Right-of-Way (ROW) encroachments.
- Drainage Culvert Extension: The new roadway will require the extension of multiple drainage culverts and the creation of new headwalls at Murrieta Creek.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Our field exploration consisted of the excavation of eight (8) borings and three (3) percolation/infiltration tests excavated along the proposed alignment to provide basis for pavement design and earthwork construction. Prior to excavation, the boring locations were marked for coordination with Underground Service Alert (USA) and an encroachment permit was acquired from City of Temecula. During exploration, in-situ undisturbed (Cal Ring) and disturbed/bulk samples were collected from the borings for further laboratory testing and evaluation. Approximate locations of the exploratory borings from this and previous investigations are depicted on the *Boring Location Map* (Figure 4). Sampling was conducted by a staff geologist from our firm. After logging and sampling, the excavations were loosely backfilled with spoils generated during excavation. The exploration logs are included in Appendix A.

2.2 Laboratory Testing

Laboratory tests were performed on representative bulk and ring samples collected during our field exploration to determine the geotechnical engineering properties of subsurface materials. The following laboratory tests were performed:

- Sieve Analysis,
- Collapse Potential,
- Expansion Index,
- Maximum density and moisture content relationships,
- Atterberg Limits,
- Corrosivity,
- Sand Equivalent; and
- R-value.

The laboratory tests were performed in general conformance with ASTM or California Test Methods. The laboratory results are included in Appendix B.

3.0 SUMMARY OF GEOLOGIC FINDINGS

3.1 Regional Geologic Setting

The site is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that generally trend northwestward. Tectonic activity along the numerous faults in the region has created the geomorphology present today. Specifically, the site is located along the southern portion of a fault controlled down dropped graben, known as the Elsinore Trough. The Elsinore Trough is bounded on the northeast by the Wildomar Fault segment of the Elsinore Fault Zone and on the southwest by the Murrieta Creek and Willard faults (See Fig. 3)

3.2 Subsurface Conditions / Earth Materials

Based on our field exploration, the site is covered by artificial fill and underlain by alluvial soils. These units are discussed in the following sections in order of increasing age. A more detailed description of each unit is provided on the logs of borings in Appendix A.

- **Artificial Fill:** Artificial fill was encountered along the project alignment in all borings varying in depth from 2 to 7.5 feet below ground surface (BGS). As encountered in our borings, the fill is loose to medium dense and consists of silty sand (SM) near the surface and sandy lean clay (CL) at greater depth. The results of our laboratory testing on representative soil samples indicate that this fill possesses R-Values ranging from 4 to 18 and expansion index of less than 51.
- **Alluvium:** The alluvium was encountered below the artificial fill along the proposed alignment to the maximum depth explored of 21.5 feet BGS. The alluvium predominantly consists of medium stiff to stiff sandy lean clay (CL) and loose to medium dense, silty to clayey sand (SC-SM) and interbedded poorly- to well-graded sand (SP-SW) at depth. The results of our laboratory testing on representative soil samples indicate that this fill possesses R-Values ranging from 4 to 18 and expansion index of less than 51.

Based on our field exploration, the pavement thickness in existing Diaz Road varies from one location to another. The pavement thickness as encountered in our borings and previous borings are summarized below.

Table 1. Existing Pavement Thickness

Location (see Figure 4)	Approx. AC Thickness (Inch)	Approx. Aggregate Base Thickness (Inch)
LB-3	7.0	12.0
LB-7	5.5	7.0 (Geogrid)
LB-8	5.0	6.0
BH-6	10.5	17
BH-7	5.5	- (AC Core only)
BH-8	6.5	15

3.3 Observed Pavement Condition

The existing pavement surface condition as well as pavement thickness appears to vary within this portion of Diaz Road. Our observations can be summarized as follows:

- The AC thickness generally varies from 5.0 to 10.5 inches and aggregate base (AB) layer varies from 10 to 17 inches as summarized in Table 1 above.
- Existing pavement is characterized with fair to poor surface conditions manifested in thermal cracking. Patching and potholing is typically noted in localized areas south of Winchester Road.
- Existing pavement within the unimproved portion of Diaz Road (~Via Montezuma to Avenida Alvarado) is also characterized by severe alligator cracking and poor ride quality. There is no pavement north of Dendy Parkway.

3.4 Surface and Groundwater

No surface water was observed at the time of our field exploration along the proposed alignment. Groundwater was encountered in 4 of our recent borings at varying depths. However, groundwater conditions can fluctuate seasonally and also be directly-impacted by other factors not observed at the time of our field explorations. Depth to groundwater (where encountered) is summarized in the table below.

Table 2. Depths to Groundwater

Boring #	Approximate Depth to Groundwater (ft)
LB-1	18.70
LB-3	13.25
LB-4	11.83
LB-7	11.33

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

The proposed roadway improvements are feasible from a geotechnical viewpoint provided that the following recommendations are incorporated into the design and construction phases of development.

4.2 General Earthwork Considerations

Earthwork associated with the proposed improvements should be performed in accordance with applicable City standards, “Standard Specifications for Public Works Construction” (Green Book, latest edition), and the recommendations included in the text of this report. The General Earthwork and Grading Specifications in Appendix D, are general grading specifications provided for typical grading projects and some of the recommendations may not be strictly applicable to this project. In case of conflict, the specific recommendations contained in the text of this report supersede those included in Appendix D.

4.3 Subgrade Preparation and Remedial Earthwork

Prior to earthwork, the areas to receive fill and new pavement should be cleared and stripped of debris, deleterious material, organics, and vegetation. Cleared and grubbed material that may be encountered or created should be removed and appropriately disposed of. Voids created by removal of buried/unsuitable materials should be backfilled with properly compacted soil in general accordance with the recommendations of this report. Specific remedial grading recommendations for the proposed improvements should be as follows:

- **New Road Embankment / Pavement and Miscellaneous Retaining walls and/or Drainage Structures:** The upper 3 feet of soils/alluvium below planned subgrade or footing elevation should be over-excavated (OX) and recompacted. The horizontal limits of OX below footings or fills should be equivalent to the vertical OX (projected down and away at a 1:1 slope from the outside edge of footings/fill). Localized areas of deeper or shallower OX may be required, depending on the actual conditions encountered during construction.

- **Street Sidewalks and Multi-Use Trail:** In landscape or unpaved areas that are going to receive new Bike Trail pavement and/or fill, a minimum of 1.5-foot OX should be anticipated prior to placement of new fill or new pavement. The OX should extend horizontally a minimum distance of 2 feet from edges of new fills or improvement. The required OX depth should be further verified during construction.

After remedial removal described above is completed, the exposed subgrade surface should be scarified, moisture conditioned and compacted to at least 90 percent relative compaction (per ASTM D1557). Further field evaluation by the geotechnical consultant during construction may require localized additional removal and compaction. Excavations should be performed in accordance with the project plans, specifications, and all applicable OSHA requirements.

4.4 Fill Materials

Onsite soils should generally be suitable as fill materials for street subgrade provided they are free of rocks over 6 inches in diameter and organic matter. Fill should be compacted in uniform horizontal lifts by mechanical means to at least 90 percent relative compaction as determined per ASTM D 1557 (Modified Proctor) or as required per City standards.

Import soils and/or borrow sites, if needed, should be evaluated by the geotechnical consultant prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have a low expansion potential (EI<51) and R-value greater than 12 if to be used in upper 12 inches of street subgrade.

4.5 Shrinkage

The volume change of excavated onsite materials upon compaction is expected to vary with depth of excavation, location, material type and compaction effort during grading. As such, the in-place and compacted densities of these materials vary and accurate determination of shrinkage for any specific area cannot be made, especially in the case of this project where soils vary considerably from one area to another.. For preliminary planning purposes and based on our field observations, we recommend that a shrinkage factor of 10 percent to 15 percent be applied for the proposed remedial grading.

4.6 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1 of the Standard Specifications for Public Works Construction ("Greenbook"), latest edition. Fill material above the pipe zone should be placed in lifts not exceeding 8 inches in un-compacted thickness and should be compacted to at least 90 percent relative compaction (per ASTM D1557) by mechanical means only. Site soils may generally be suitable as trench backfill provided these soils are screened of rocks over 3 inches in diameter and organic matter.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the California Construction Safety Orders (latest Edition). The contractor should be responsible for providing a “competent person” as defined in Article 6 of the California Construction Safety Orders. Contractors should be advised that sandy soils (such as fills generated from the onsite fill and alluvium) could make excavations particularly unsafe if all safety precautions are not properly implemented. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton does not consult in the area of safety engineering.

4.7 Preliminary Pavement Design

The preliminary pavement design provided below is based on the Caltrans Highway Design Manual (HDM) and applicable City street standards. Based on testing of our collected samples, R-values of the near-surface soils are expected to generally vary from 4 to 18. As such, an average R-value of 12 has been used for preliminary design purposes. City of Temecula minimum pavement section for a traffic index of 10 is 0.50’ AC over 1.17’ AB.

Table 3. Preliminary Pavement Design

Boring	Design R-value	Traffic Index	Pavement Structural Sections (ft)
LB-2	12	10	0.50 AC / 1.60 CAB

-AC is asphalt concrete conforming to applicable City Standards, Greenbook. and Caltrans Standard Specs
-AB is aggregate base (CAB, Class 2 AB or CMB) conforming to applicable City Standard, Greenbook, and Caltrans Standard Specifications

Pavement design and construction should also conform to applicable City and industry standards. Final pavement section may differ from stated in table above depending on actual R-value of subgrade soils during construction. The Caltrans pavement section design calculations were based on a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance.

Although not anticipated on this project, any imported materials placed within the upper 2.5 feet of finished grade should have a minimum R-value of 12 and should be non-corrosive and of low expansion. Other construction materials such as aggregates, asphalt, and Portland cement should be imported from local commercial sources. No potential sources for import materials have been pre-tested for this project. Therefore, prior to import, the materials should be tested and approved by the Geotechnical Engineer.

4.8 Rehabilitation of Existing Pavement

Based on our review and alignment pavement borings (See Table 1), the current pavement section does not meet the City minimum (except BH-6) or minimum design thickness. However, there are several rehabilitation methods that can be implemented by the City to help preserve existing pavement, although not improve to current design requirements.. The pros and cons of each method can be evaluated based on cost analysis, desired life span, and construction sequence and its impact on existing traffic. Based on our experience with similar projects and existing pavement conditions, the most viable options may include the following:

- Option 1: Application of slurry seal after properly cleaning existing cracks and filling with elastomeric crack sealant. This option is typically considered the least expensive option, provides no structural improvement and the shortest life span.
- Option 2: Cold plane/milling minimum of 0.15-foot of existing HMA and placement of a minimum of 0.15-foot Rubberized Hot Mix Asphalt (RHMA) or HMA overlay. This option typically provides a longer life span than Option 1, as well as better ride quality, but will not meet current design requirements.
- Option 3: Complete removal of existing AC layer or AC/AB layer and placement of new HMA layer on top of properly prepared aggregate base and subgrade. This method is only applicable to limited areas where existing pavement distress appears to be associated with subgrade failure, but will not meet current design requirements.
- Option 4: In order to meet current pavement thickness minimum, a complete removal of AC and underlying AB layer and pavement re-construction will be required. Alternatives such as full depth reclamation or cold central plant recycling can also be considered.

4.9 Retaining Walls / Culverts

For design of culverts and/or retaining walls associated with this project, the calculated Peak Ground Acceleration (PGA) is approximately 0.54g for this site using Caltrans ARS online tool (V2.3.09) with a mean moment magnitude (Mw) of 6.87. Details of the ARS analysis and resulting ARS curve are presented in Appendix C.

Where applicable, Caltrans Standard Reinforced Concrete retaining walls up to 20 feet in height can be constructed on this project since the Coefficient of Horizontal Acceleration, k_h does not exceed 0.2 (or <1/3 PGA=0.54g). Where conventional retaining walls are to be designed, the following preliminary design parameters may be considered:

- Average Moist Unit weight of soil = 120 pcf

- Average Saturated Unit Weight of Soil = 140 pcf
- Service Permissible Net Contact Stress = 2.5 ksf (footing width >4 feet)
- Strength Factored Gross Nominal Bearing Resistance = 5 ksf (footing width >4 ft)
- Extreme Event Factored Gross Nominal Bearing Resistance = 6 ksf (footing >6 ft)
- Friction coefficient = 0.35
- A minimum of 3-foot over-excavation (OX) will be required for footings founded at 3 feet below existing ground surface (BGS), or shallower. A 2-foot OX will be required if footings are founded at depths greater than 4 feet BGS or deeper.

For non-restrained walls, an incremental seismic earth pressures of 14H psf, where H is the retaining wall stem height in feet, should be applied for design in addition to static earth and surcharge pressures discussed below. For restrained walls, an equivalent pressure of 55 pcf should be applied. For 2:1 (horizontal:vertical) sloping backfill, we recommend an equivalent fluid pressure of 52 pounds per cubic foot (pcf) for the active condition, and 80 pcf for the at-rest condition. Hydrostatic pressure should also be incorporated into to the above equivalent fluid pressures, where applicable.

Surcharge loads such as adjacent structures, and/or traffic loading should be considered in design of retaining walls. Loads applied within a 1:1 (horizontal:vertical) projection down from the surcharging structure on the stem of the wall should also be considered in wall design. In general, 0.30 of uniform vertical surcharge-loads should be applied as a horizontal pressure on cantilever (active) retaining walls, while half of uniform vertical surcharge-loads should be applied as a horizontal pressure on braced (at-rest) retaining walls (assuming sand soils backfill).

4.10 Corrosion Potential

Caltrans *Corrosion Guidelines* (Caltrans, 2018) state that a site is considered to be corrosive to foundation elements or underground structures if one or more of the following conditions exist for the soil and/or water samples taken at the site:

- Chloride concentration greater than or equal to 500 ppm
- Sulfate concentration greater than or equal to 1,500 ppm
- pH of 5.5 or less

Based on our laboratory testing on a representative soil sample, the onsite soils are considered to be non-corrosive to foundation elements or underground structures.

4.11 Percolation/Infiltration Testing

Three (3) percolation tests were performed for preliminary screening along the proposed alignment (see, Figure 4) in general accordance with the procedures of the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Design Handbook (RCFC, 2018). Percolation tests were performed at a depth of approximately 5 feet BGS. Due to relatively high clay/silt content and dense artificial fill, the onsite soils/artificial fill possess very poor percolation characteristics (practically impermeable). The actual test results/data sheets are included in Appendix C.

4.12 Construction Observation

Observation and testing should be performed by Leighton's representatives during excavation/construction. It should be anticipated that the substrata exposed during construction may vary from that encountered in the test borings. Reasonably continuous construction observation and review during the proposed improvements allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction.

Site preparation, removal of unsuitable soils, trench excavation, shoring, approval of imported earth materials, fill placement of bedding and backfill, and other site geotechnically-related operations should be observed and tested by Leighton.

5.0 LIMITATIONS

This report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is necessarily incomplete. The nature of many sites is such that differing characteristics can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time. This evaluation was performed with the understanding that the proposed improvements are as described in Section 1.1 of this report.

The client is referred to Appendix E regarding important information provided by the Geoprofessional Business Association (GBA) on geotechnical engineering studies and reports and their applicability.

This report was prepared for our Client based on their needs, directions, and requirements at the time of our investigation. This report is not authorized for use by, and is not to be relied upon by any party except our Client, and its successors and assigns as owner of the property, with whom Leighton has contracted for the work. Use of or reliance on this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton.

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Project: 12502.001	Eng/Geol: SIS/RFR
Scale:1 " = 2,000 '	Date: July 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

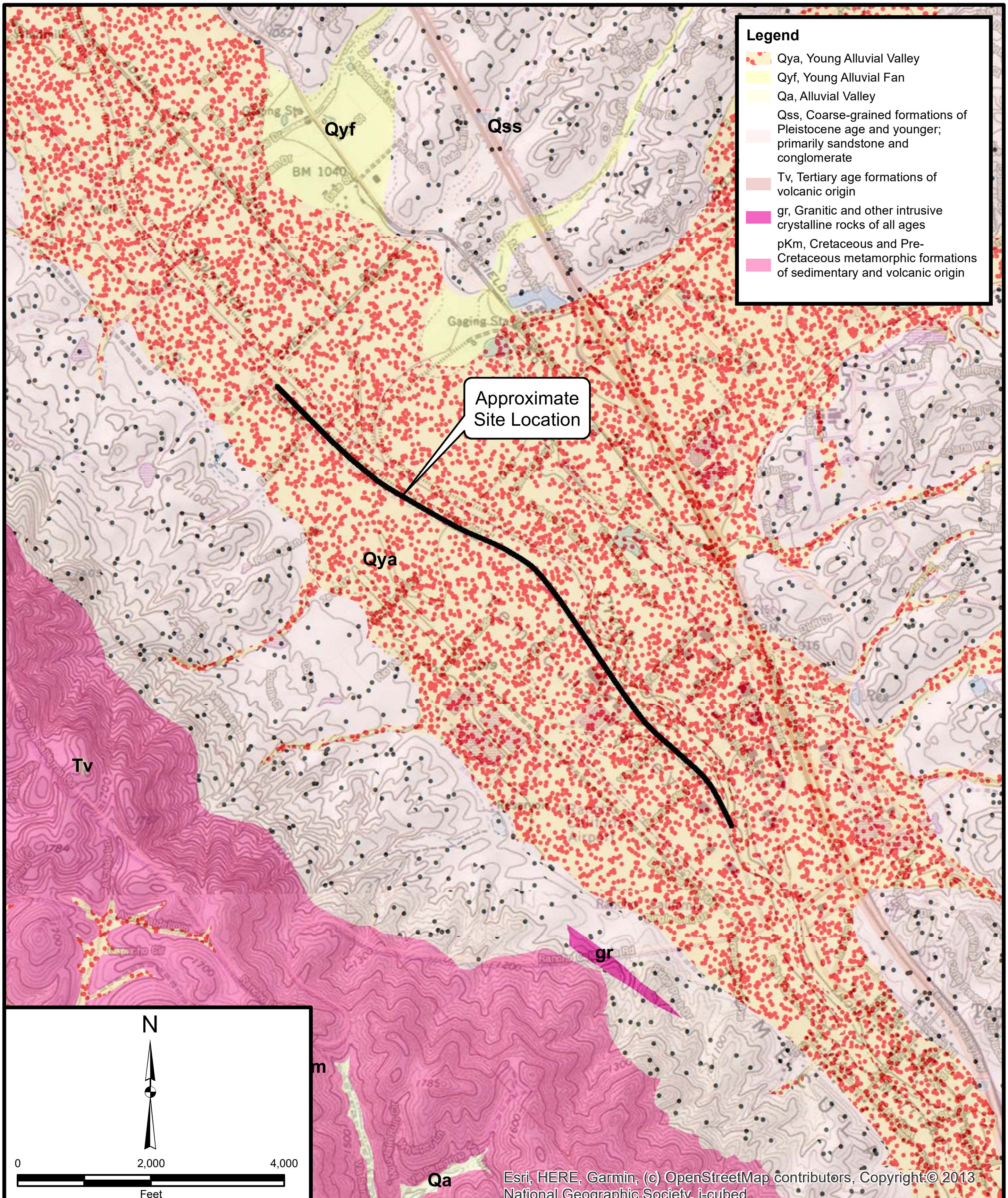
SITE LOCATION MAP

Diaz Road Geotechnical Exploration PW 17-25
Temecula, California

Figure 1

Leighton

Map Saved as V:\Drafting\12502\001\Maps\12502-001_F01_SLM_2020-06-12.mxd on 5/18/2020 11:41:17 AM



Project: 12502.001
Eng/Geol: SIS/RFR
Scale: 1 " = 2,000 '
Date: July 2020
Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton, USGS
Author: Leighton Geomatics (btran)

REGIONAL GEOLOGY MAP
Diaz Road Geotechnical Exploration PW 17-25
Temecula, California

Figure 2

Leighton

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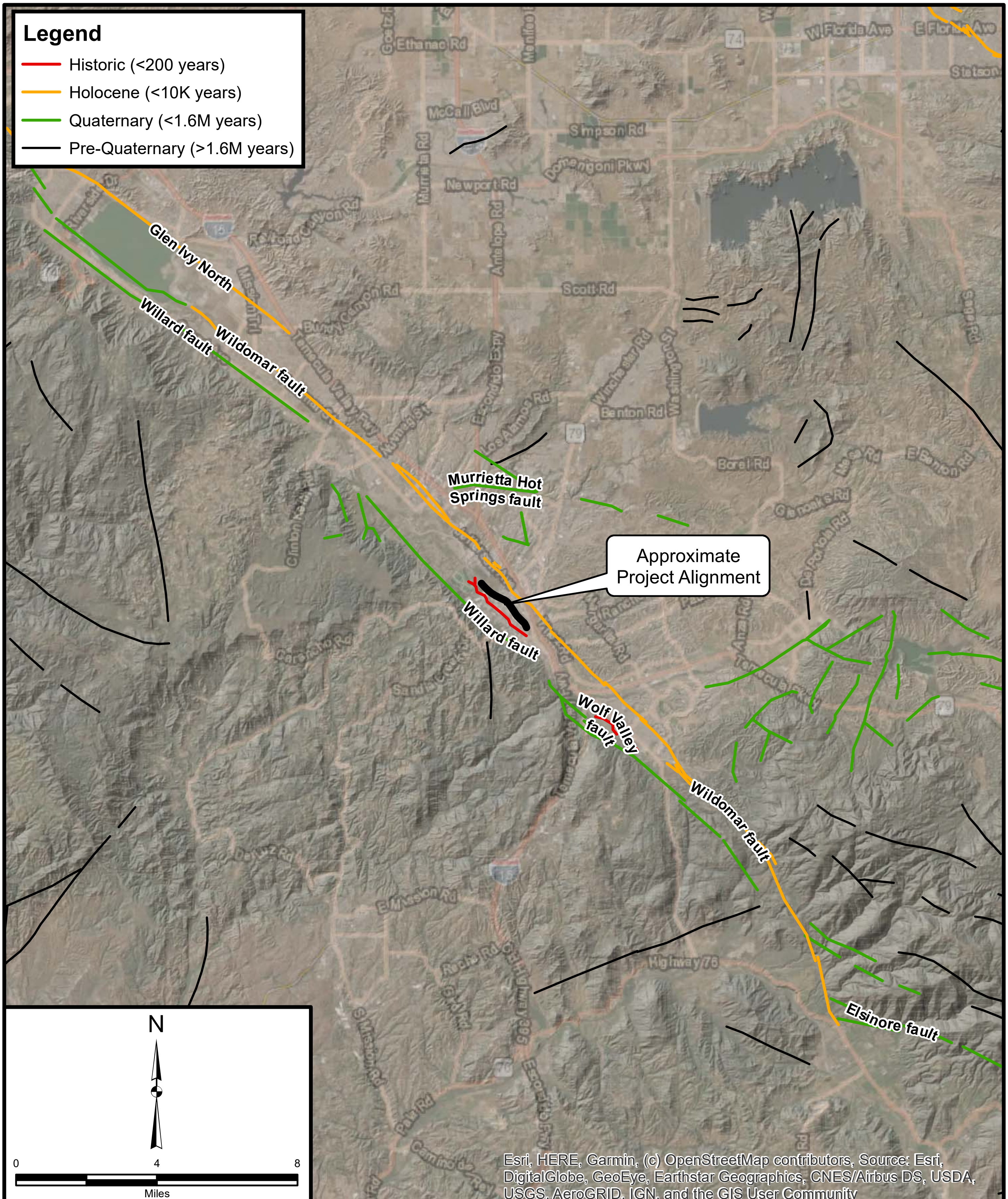

Project: 12502.001	Eng/Geol: SIS/RFR
Scale:1 " = 4 miles	Date: July 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton, Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: CGS
Author: Leighton Geomatics (btran)

REGIONAL FAULT MAP

Diaz Road Geotechnical Exploration PW 17-25
Temecula, California

Figure 3

Leighton

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Project: 12502.001	Eng/Geol: SIS/RFR
Scale: 1 " = 800 '	Date: July 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

BORING LOCATION MAP
Diaz Road Geotechnical Exploration PW 17-25
Temecula, California

Figure 4

Leighton

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APPENDIX A

Logs of Exploratory Borings (This and Previous Explorations)

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these logged locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between sampling intervals and soil types; and the transition may be gradual.

GEOTECHNICAL BORING LOG LB-1

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0			B-1				SM	**Artificial Fill (Af)**; SILTY SAND, gray, slightly moist, fine grained sand	
				R-1	11 17 19	109	4		SILTY SAND, medium dense, grayish brown, moist, fine to medium grained sand	
	5			R-2	8 12 15			SP-SM	Poorly graded SAND with SILT, medium dense, grayish brown, moist, fine to medium grained sand	
				R-3	5 9 11	115	16	CL	**Quaternary Alluvium (Qal)**; SANDY Lean CLAY, stiff, dark grayish brown, moist, fine to medium grained sand	
	10			R-4	6 10 10			SC	CLAYEY SAND, medium dense, dark grayish brown, moist, fine to medium grained sand	
	15			R-5	3 6 12			SC-SM	SILTY, CLAYEY SAND, medium dense, dark grayish brown, moist, fine to medium grained sand, roots, petrochemical odor	
	20			R-6	4 5 5			SW-SM	Well-graded SAND with SILT, loose, dark grayish brown, wet, fine to coarse grained sand	
									Drilled to 21.5' Sampled to 21.5' Groundwater at 18.7' Backfilled with cuttings	
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-2

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Artificial Fill (Af)**; SILTY SAND with GRAVEL, grayish brown, slightly moist, fine to coarse grained sand	
				R-1	7 8 9	112	16	CL	**Quaternary Alluvium (Qal)**; SANDY Lean CLAY, stiff, dark grayish brown, moist, fine to medium grained sand	
	5			R-2 B-1	6 7 9	106	21		SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand, MD = 125.3 @ 11.0%, EI = 55, RV = 16	MD, EI, RV, AL CR
				R-3	2 3 5				SANDY Lean CLAY, medium stiff, dark gray, moist, fine grained sand	
	10			R-4	2 3 5	94	29		SANDY Lean CLAY, medium stiff, dark gray, moist, fine grained sand	
	15			R-5	4 11 11				Lean CLAY, stiff, olive brown, moist, no recovery, resample W/SPT	
									Drilled to 16.5' Sampled to 16.5' Groundwater not encountered Backfilled with cuttings	
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-3

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							ASPHALT	7"AC/12"AB	
				B-1				CL	**Artificial Fill (Af)**; Lean CLAY with SAND, dark grayish brown, moist, fine to coarse grained sand	
				R-1	2 3 4	112	15		SANDY Lean CLAY with GRAVEL, medium stiff, dark grayish brown, moist, fine to coarse grained sand with fine gravel	
	5			R-2	5 12 16	113	16		SANDY Lean CLAY, stiff, dark gray, moist, fine to medium grained sand	
				R-3	3 5 6	102	22	CL	**Quaternary Alluvium (Qal)**; Lean CLAY, medium stiff, dark brown, moist	
	10			R-4	3 5 6				SANDY Lean CLAY, stiff, dark grayish brown, moist, fine to medium grained sand	
	15			R-5	2 3 6				SANDY Lean CLAY, stiff, dark grayish brown, wet, fine to coarse grained sand	
	20			R-6	4 10 16				SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand	
									Drilled to 21.5' Sampled to 21.5' Groundwater at 13.25' Backfilled with cuttings	
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-4

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	**Artificial Fill (Af)**; SILTY SAND with GRAVEL, grayish brown, moist, fine to coarse grained sand with fine gravel	
				R-1	10 13 9	127	10		SILTY SAND, medium dense, dark grayish brown, moist, fine to coarse grained sand	
	5			R-2 B-1	10 19 28	120	13	ML	SANDY SILT, hard, dark grayish brown, moist, fine grained sand, MD = 129.5 @ 8.8%	MD, SA, CR
				R-3	8 9 12	112	13	SM	**Quaternary Alluvium (Qal)**; SILTY SAND, medium dense, dark gray, moist, fine to medium grained sand	
	10			R-4	7 13 33			SC	CLAYEY SAND, medium dense, dark grayish brown, moist, fine to medium grained sand	
								SW	Well-graded SAND, medium dense, gray, wet, fine to coarse grained sand	
	15			R-5	6 8 11			SC	CLAYEY SAND, medium dense, dark grayish brown, moist, fine to medium grained sand	
									Drilled to 16.5' Sampled to 16.5' Groundwater at 11.83' Backfilled with cuttings	
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-5

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1				ML	**Artificial Fill (Af)**; SANDY SILT, grayish brown, slitghtly moist, fine grained sand, RV = 18	RV, SA
				R-1	6 5 6	115	13	SM	SILTY SAND with GRAVEL, loose, dark grayish brown, moist, fine to coarse grained sand with fine gravel	
	5			R-2	10 20 23				SILTY SAND, medium dense, dark gray, moist, fine to coarse grained sand	
				R-3	8 12 11			SM	**Quaternary Alluvium (Qal)**; SILTY SAND, medium dense, dark grayish brown, moist, fine grained sand	
	10			R-4	3 6 5	106	21	SC	CLAYEY SAND, medium dense, dark gray, wet, fine grained sand	
	15			R-5	3 4 3			SW	Well-graded SAND, loose, dark gray, wet, fine to coarse grained sand	
	20			R-6	5 4 6				Well-graded SAND, loose, dark gray, wet, fine to coarse grained sand	
									Drilled to 21.5' Sampled to 21.5' Groundwater not encountered Backfilled with cuttings	
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-6

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0							SC	**Artificial Fill (Af)**; CLAYEY SAND, dark gray, moist, fine grained sand	
				R-1	19 20 16	124	10	SM	SILTY SAND with GRAVEL, medium dense, dark gray, moist, fine to coarse grained sand with fine gravel	
	5			R-2 B-1	10 14 15				SILTY SAND with GRAVEL, medium dense, dark gray, moist, fine to coarse grained sand with fine gravel	
				R-3	2 4 5	95	27	CL	**Quaternary Alluvium (Qal)**; SANDY Lean CLAY, medium stiff, dark gray, moist, fine grained sand	
	10			R-4	5 12 12			SC-SM	SILTY, CLAYEY SAND, medium dense, dark brown, moist, fine to medium grained sand	
	15			R-5	3 6 8			CL	SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand	
									Drilled to 16.5' Sampled to 16.5' Groundwater not encountered Backfilled with cuttings	
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-7

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0							ASPHALT	5.5"AC/7"AB/Geogrid	
				B-1				CL-ML	**Artificial Fill (Af)**; SILTY CLAY with SAND, dark gray, moist, fine grained sand, MD = 118.7 @ 11.5%, EI = 41, RV = 4	MD, EI, RV, AL
				R-1	2 3 4	94	25		SILTY CLAY, medium stiff, dark gray, moist	
	5			R-2	3 6 8	98	24	CL	**Quaternary Alluvium (Qal)**; Lean CLAY, medium stiff, dark brown, moist	
				R-3	4 4 6				Lean CLAY, stiff, dark grayish brown, moist	
	10			R-4	3 5 6	108	19		SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand	
	15			R-5	5 7 10				SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand	
	20			R-6	5 7 20				SANDY Lean CLAY, stiff, dark gray, moist, fine grained sand	
								SW	Well-graded SAND, medium dense, gray, wet, fine to medium grained sand	
									Drilled to 21.5' Sampled to 21.5' Groundwater at 11.33' Backfilled with cuttings	
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG LB-8

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0								5"AC/6"AB	
									Hole terminated at .92' due to underground utilities Groundwater not encountered Backfilled with cuttings	
	5									
	10									
	15									
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG P-1

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							CL	**Artificial Fill (Af)**; Lean CLAY, dark gray, moist	
				S-1	3 3 4				SANDY Lean CLAY with GRAVEL, stiff, dark grayish brown, moist, fine to coarse grained sand with fine gravel	
	5								Drilled to 5' Sampled to 5' Groundwater not encountered Backfilled with cuttings	
	10									
	15									
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG P-2

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Artificial FIll (Af)**; SILTY SAND, gray, moist, fine grained sand	
				S-1	5 5 4			SC	CLAYEY SAND, medium dense, dark gray, moist, fine to medium grained sand	
	5								Drilled to 5' Sampled to 5' Groundwater not encountered Backfilled with cuttings	
	10									
	15									
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG P-3

Project No.	12502.001	**Date Drilled**	5-15-20
Project	Diaz Road Geotechnical Exploration	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Boring Location Map	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Artificial Fill (Af)**; SILTY SAND with GRAVEL, light brownish gray, slightly moist, fine to coarse grained sand with fine gravel SILTY SAND, dark gray, moist, fine to medium grained sand	
				S-1	4 6 6			SC	CLAYEY SAND, medium dense, dark gray, moist, fine to medium grained sand	
	5								Drilled to 5' Sampled to 5' Groundwater not encountered Backfilled with cuttings	
	10									
	15									
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-8

Project No.	10807.001	**Date Drilled**	9-18-14
Project	Temecula Valley Recycled Water Pipeline	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 4	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Artificial Fill (Af)**; SILTY SAND with GRAVEL, dark grayish brown, moist, fine to coarse grained sand, gravel to 1"	
								SC	CLAYEY SAND, dark brown, moist, fine to medium grained sand	
	5			R-1 B-1	10 13 13	120	13	SM	SILTY SAND with GRAVEL, medium dense, dark grayish brown, moist, fine to coarse grained sand with fine gravel, SE = 9	CR, SE
								ML	**Quaternary Allvium (Qal)**; SILT with SAND, moist, very dark grayish brown, very fine to fine grained sand	
	10			R-2	5 6 7	93	26	CL	SILTY CLAY, stiff, dark grayish brown, moist, fine grained sand, CO = -0.6%	CO
	15			R-3	3 4 6	108	19		Lean CLAY, stiff, dark grayish brown, moist	
									Drilled to 16.5' Sampled to 16.5' Groundwater not encountered Backfilled with Cuttings	
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-9

Project No.	10807.001	**Date Drilled**	9-18-14
Project	Temecula Valley Recycled Water Pipeline	**Logged By**	JTD
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	'
Location	See Figure 4	**Sampled By**	JTD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	**Artificial Fill (Af)**; SILTY SAND with GRAVEL, light brownish gray, dry to moist, fine to coarse grained sand with gravel and cobble to 5"	
									SILTY SAND with GRAVEL, grayish brown, moist, fine to coarse grained sand with fine gravel	
	5			R-1	10 14 17	113	17	ML	**Quaternary Alluvium (Qal)**; SILT with SAND, stiff, dark grayish brown, moist, very fine to fine grained sand	SA
				R-2 B-1	6 7 8	118	17		SILT with SAND, stiff, dark brown, moist, very fine to fine grained sand, EI = 43	EI
	10			R-3	4 5 6	107	19		SANDY SILT, stiff, very dark brown, moist, fine to medium grained sand	
	15			R-4	6 6 7			SM	SILTY SAND, loose, very dark brown, moist to wet, fine grained sand, no recovery, resample with spt	
									Drilled to 16.5' Sampled to 16.5' Groundwater not encountered Backfilled with Cuttings	
	20									
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/19/2011
Elevation:	1,025 Ft. (MSL)	Boring No:	BH-6

Sample	Blow Counts	Bulk Sample	Cohesion (psf)	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description
									10 1/2" Asphalt / 17" Aggregate base
■	3/4/5			18.3	6.6	105.7	2		Silty Sand (SM); light olive brown, moist, loose, fine-grained (Fill).
							4		
■	5/11/14			39.8	20.2	111.0	6		Clayey Sand (SC); dark yellowish brown, very moist, medium dense, fine-grained (Qal).
							8		
							10		
■	3/5/6			43.0	17.1	108.5	12		Clayey Sand (SC); yellowish brown, very moist, loose, fine-graied (Qal).
							14		
							16		Terminated at ~13.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:
Diaz Road - Sta. 21+00

EMWD 30-INCH FORCE MAIN ALIGNMENT
TEMECULA, CALIFORNIA

Project No: 644-11020
Report No: 11-11-203

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/19/2011
Elevation:	1,030 Ft. (MSL)	Boring No:	BH-7

Sample	Blow Counts	Bulk Sample	Cohesion (psf)	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description
									5 1/2" Asphalt
							2		Terminated at ~0.6 Inches bgs (AC Core).
							4		
							6		
							8		
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:
Diaz Road - Sta. 16+00

EMWD 30-INCH FORCE MAIN ALIGNMENT
TEMECULA, CALIFORNIA

Project No: 644-11020
Report No: 11-11-203

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/19/2011
Elevation:	1,030 Ft. (MSL)	Boring No:	BH-8

Sample	Blow Counts	Bulk Sample	Cohesion (psf)	% Minus #200	% Moisture	Dry Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0		6 1/2" Asphalt / 15" Aggregate base
■	3/5/6	3	340	33.5	10.3	109.3	2–4		Clayey Sand (SC); dark yellowish brown, moist, loose, fine-grained (Fill).
■	3/4/5			86.2	25.8	99.0	6–10		Sandy Clay (CL); dark yellowish brown, very moist, medium stiff, low plasticity (Qal).
■	3/3/5			43.2	23.0	104.4	12–14		Silty Sand (SM); dark yellowish brown, very moist, very loose, fine-grained (Qal).
							16–50		Terminated at ~13.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:
Diaz Road - Sta. 11+00

EMWD 30-INCH FORCE MAIN ALIGNMENT
TEMECULA, CALIFORNIA

Project No: 644-11020
Report No: 11-11-203

APPENDIX B

Laboratory Test Results(This and Previous Explorations)

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	06/03/20
Project No.:	12502.001	Input By:	M. Vinet	Date:	06/10/20
Boring No.:	LB-2	Depth (ft.):	5.0 - 10.0		
Sample No.:	B-1				
Soil Identification:	Lean Clay with Sand (CL)s, Dark Yellowish Brown.				

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5613	5679	5638			
Weight of Mold (g)	3565	3565	3565			
Net Weight of Soil (g)	2048	2114	2073			
Wet Weight of Soil + Cont. (g)	1776.3	1561.9	1335.3			
Dry Weight of Soil + Cont. (g)	1651.8	1434.2	1215.5			
Weight of Container (g)	328.2	329.0	326.4			
Moisture Content (%)	9.4	11.6	13.5			
Wet Density (pcf)	135.2	139.5	136.8			
Dry Density (pcf)	123.6	125.1	120.6			

Maximum Dry Density (pcf) 125.3 **Optimum Moisture Content (%)** 11.0

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

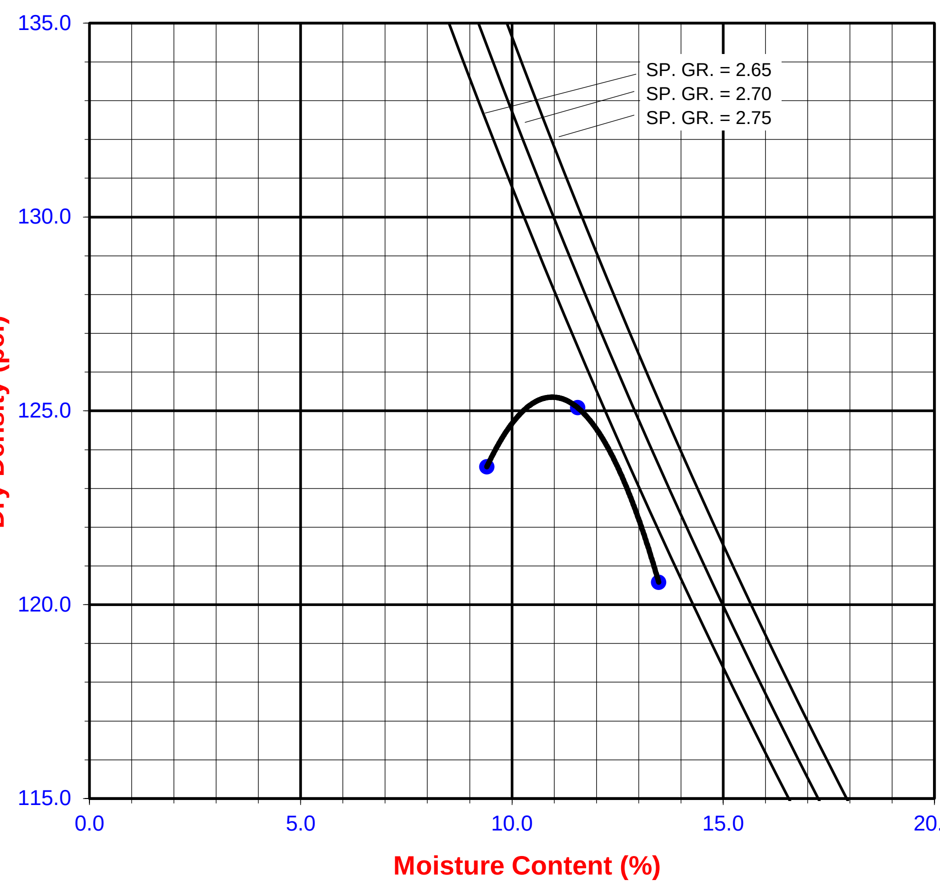
Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

32:13:19

LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Diaz Rd Expansion	Tested By: F. Mina	Date: 06/03/20
Project No.:	12502.001	Input By: M. Vinet	Date: 06/10/20
Boring No.:	LB-4	Depth (ft.): 5.0 - 10.0	
Sample No.:	B-1		
Soil Identification:	Sandy Silt s(ML), Black.		

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 — *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5600	5680	5711	5654		
Weight of Mold (g)	3565	3565	3565	3565		
Net Weight of Soil (g)	2035	2115	2146	2089		
Wet Weight of Soil + Cont. (g)	1322.2	1566.0	1156.4	1005.5		
Dry Weight of Soil + Cont. (g)	1262.1	1470.4	1073.6	922.8		
Weight of Container (g)	277.4	278.4	278.8	279.2		
Moisture Content (%)	6.1	8.0	10.4	12.8		
Wet Density (pcf)	134.3	139.6	141.6	137.9		
Dry Density (pcf)	126.6	129.2	128.3	122.2		

Maximum Dry Density (pcf) **129.5** **Optimum Moisture Content (%)** **8.8**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

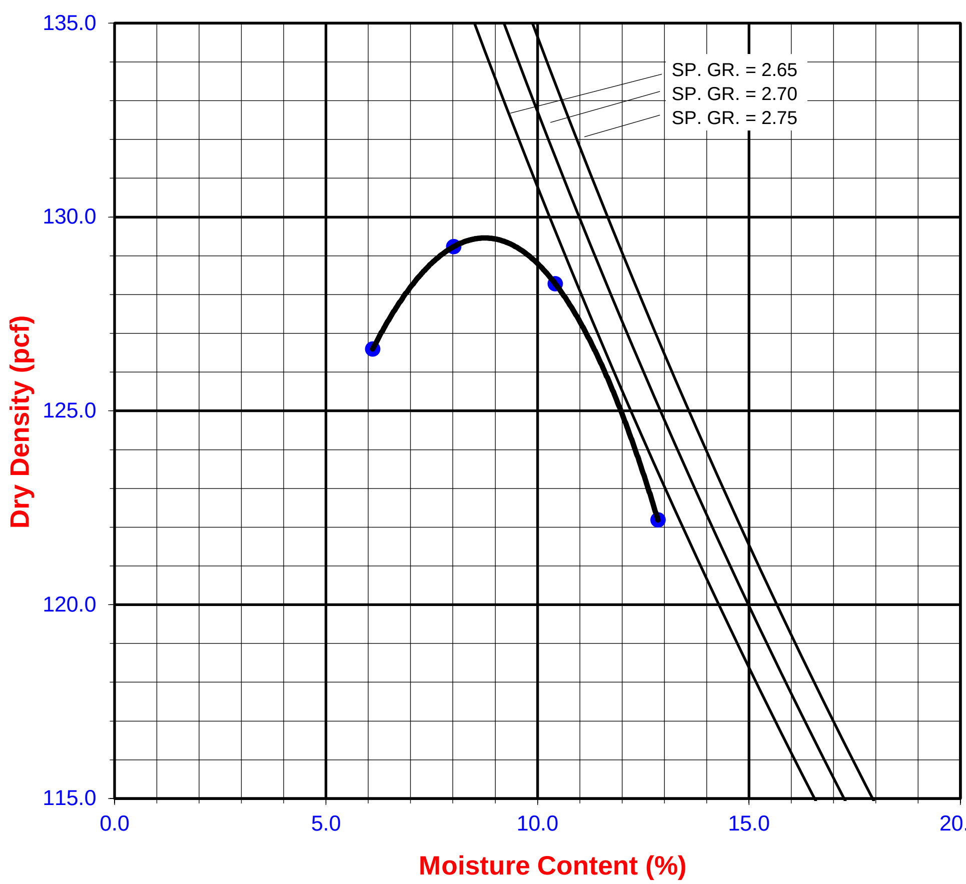
[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
0:47:53
GR:SA:FI

Atterberg Limits:

LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Leighton

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	06/03/20
Project No.:	12502.001	Input By:	M. Vinet	Date:	06/10/20
Boring No.:	LB-7	Depth (ft.):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Lean Clay (CL), Black.				

Preparation Method: [X] Moist [ ] Dry — [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 — *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5507	5580	5576	5542		
Weight of Mold (g)	3565	3565	3565	3565		
Net Weight of Soil (g)	1942	2015	2011	1977		
Wet Weight of Soil + Cont. (g)	1574.7	1668.6	1606.8	1191.0		
Dry Weight of Soil + Cont. (g)	1474.3	1521.8	1454.9	1067.6		
Weight of Container (g)	420.8	329.2	415.0	332.7		
Moisture Content (%)	9.5	12.3	14.6	16.8		
Wet Density (pcf)	128.2	133.0	132.7	130.5		
Dry Density (pcf)	117.0	118.4	115.8	111.7		

Maximum Dry Density (pcf) 118.7 **Optimum Moisture Content (%)** 11.5

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

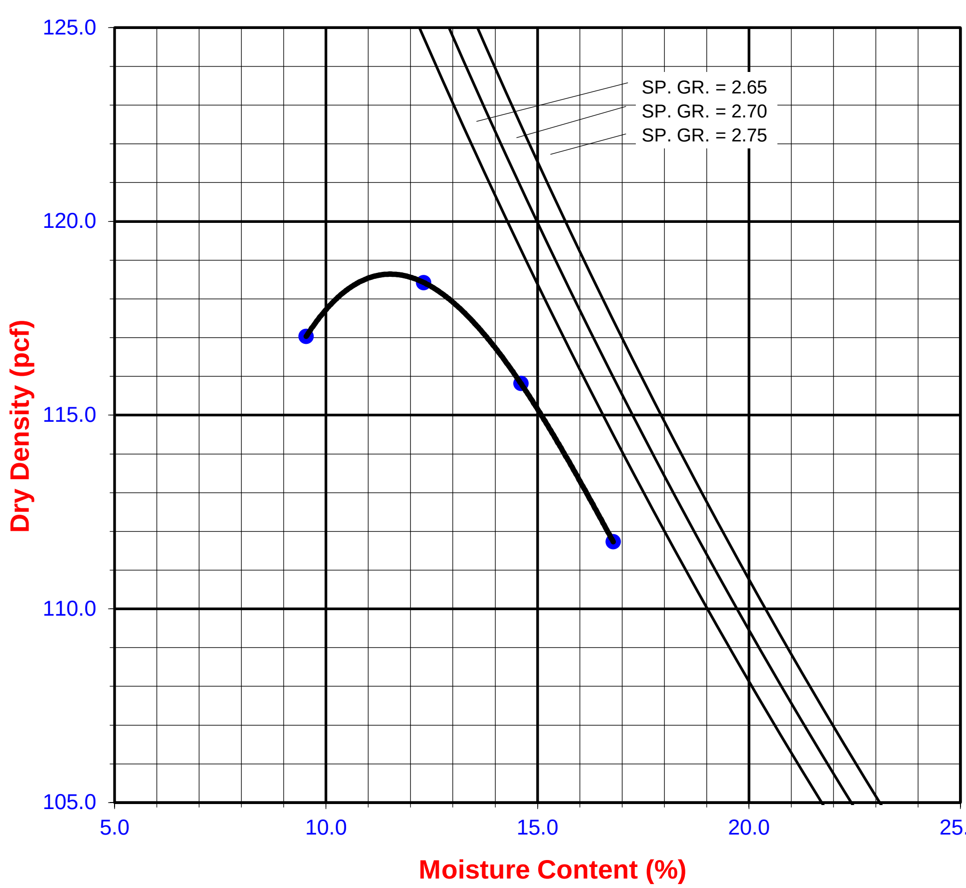
Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

33:18:15

LL,PL,PI



Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	6/3/20
Project No. :	12502.001	Checked By:	M. Vinet	Date:	6/10/20
Boring No.:	LB-2	Depth:	5.0 - 10.0		
Sample No. :	B-1	Location:	N/A		
Sample Description:	Lean Clay with Sand (CL)s, Dark Yellowish Brown.				

Dry Wt. of Soil + Cont. (gm.)	3703.5
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	3703.5
Weight Soil Retained on #4 Sieve	60.1
Percent Passing # 4	98.4

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0551
Wt. Comp. Soil + Mold (gm.)	590.5	632.2
Wt. of Mold (gm.)	200.2	200.2
Specific Gravity (Assumed)	2.70	2.70
Container No.	7	7
Wet Wt. of Soil + Cont. (gm.)	350.0	632.2
Dry Wt. of Soil + Cont. (gm.)	319.5	350.7
Wt. of Container (gm.)	50.0	200.2
Moisture Content (%)	11.3	23.2
Wet Density (pcf)	117.7	123.5
Dry Density (pcf)	105.8	100.3
Void Ratio	0.594	0.682
Total Porosity	0.373	0.405
Pore Volume (cc)	77.1	88.5
Degree of Saturation (%) [S meas]	**51.4**	**91.9**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
6/3/20	15:30	1.0	0	0.5000
6/3/20	15:40	1.0	10	0.5000
	Add Distilled Water to the Specimen			
6/4/20	7:00	1.0	920	0.5551
6/4/20	8:00	1.0	980	0.5551

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	55.1
Expansion Index (Report) =	Nearest Whole Number or Zero (0) if Initial Height is > than Final Heigh	**55**

Rev. 03-08

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	6/3/20
Project No. :	12502.001	Checked By:	M. Vinet	Date:	6/10/20
Boring No.:	LB-7	Depth:	0 - 5.0		
Sample No. :	B-1	Location:	N/A		
Sample Description:	Lean Clay (CL), Black.				

Dry Wt. of Soil + Cont. (gm.)	2870.2
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2870.2
Weight Soil Retained on #4 Sieve	49.9
Percent Passing # 4	98.3

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0405
Wt. Comp. Soil + Mold (gm.)	573.2	606.0
Wt. of Mold (gm.)	200.2	200.2
Specific Gravity (Assumed)	2.70	2.70
Container No.	8	8
Wet Wt. of Soil + Cont. (gm.)	333.7	606.0
Dry Wt. of Soil + Cont. (gm.)	300.4	331.6
Wt. of Container (gm.)	33.7	200.2
Moisture Content (%)	12.5	22.4
Wet Density (pcf)	112.5	117.6
Dry Density (pcf)	100.0	96.1
Void Ratio	0.686	0.754
Total Porosity	0.407	0.430
Pore Volume (cc)	84.2	92.6
Degree of Saturation (%) [S meas]	**49.2**	**80.2**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
6/3/20	17:00	1.0	0	0.5000
6/3/20	17:10	1.0	10	0.5000
	Add Distilled Water to the Specimen			
6/4/20	7:00	1.0	830	0.5405
6/4/20	8:00	1.0	890	0.5405

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	40.5
Expansion Index (Report) =	Nearest Whole Number or Zero (0) if Initial Height is > than Final Heigh	**41**

Rev. 03-08

R-VALUE TEST RESULTS

ASTM D 2844

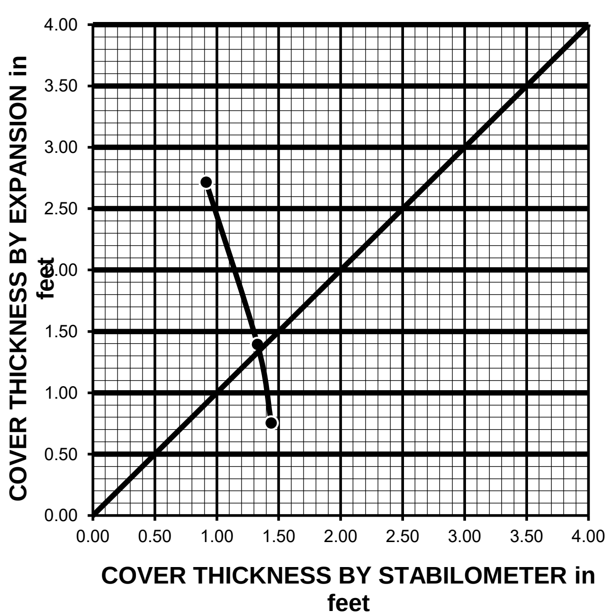
Leighton

Project Name:	Diaz Rd Expansion	Date:	6/4/20
Project Number:	12502.001	Technician:	F. Mina
Boring Number:	LB-2	Depth (ft.):	5.0 - 10.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Lean Clay with Sand (CL)s, Dark Yellowish Brown.		

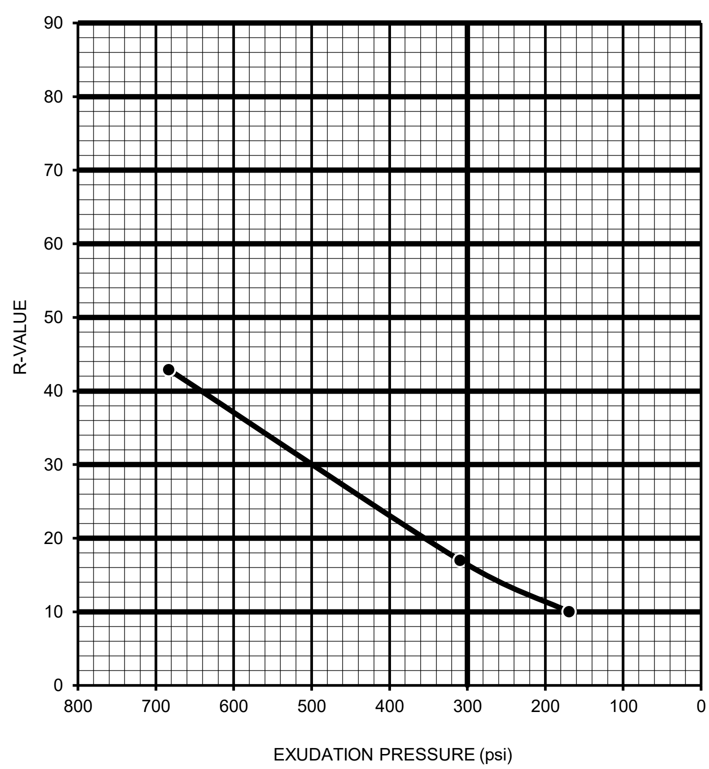
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	12.7	14.8	15.9
HEIGHT OF SAMPLE, Inches	2.45	2.57	2.59
DRY DENSITY, pcf	111.0	108.2	104.3
COMPACTOR AIR PRESSURE, psi	150	100	75
EXUDATION PRESSURE, psi	683	309	169
EXPANSION, Inches x 10exp-4	72	37	20
STABILITY Ph 2,000 lbs (160 psi)	68	119	134
TURNS DISPLACEMENT	4.50	4.60	4.96
R-VALUE UNCORRECTED	43	16	9
R-VALUE CORRECTED	43	17	10

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.91	1.33	1.44
EXPANSION PRESSURE THICKNESS, ft.	2.72	1.40	0.75

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	16
R-VALUE BY EXUDATION:	17
EQUILIBRIUM R-VALUE:	16

R-VALUE TEST RESULTS
ASTM D 2844

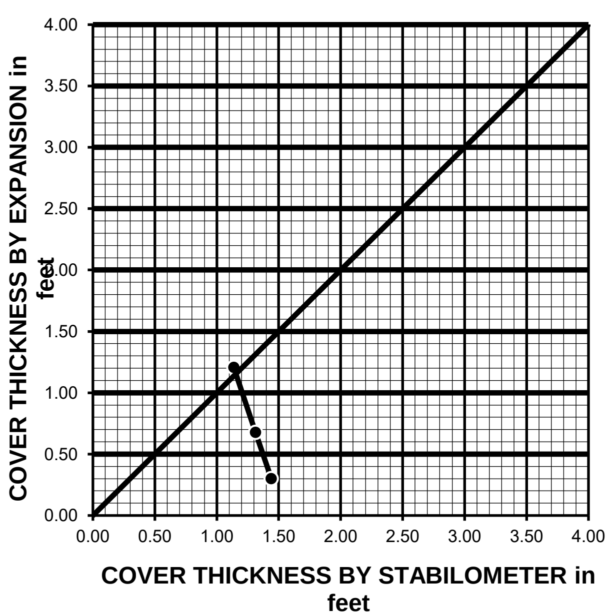
Leighton

Project Name:	Diaz Rd Expansion	Date:	6/4/20
Project Number:	12502.001	Technician:	F. Mina
Boring Number:	LB-5	Depth (ft.):	0 - 5.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Sandy Silt s(ML), Dark Yellowish Brown.		

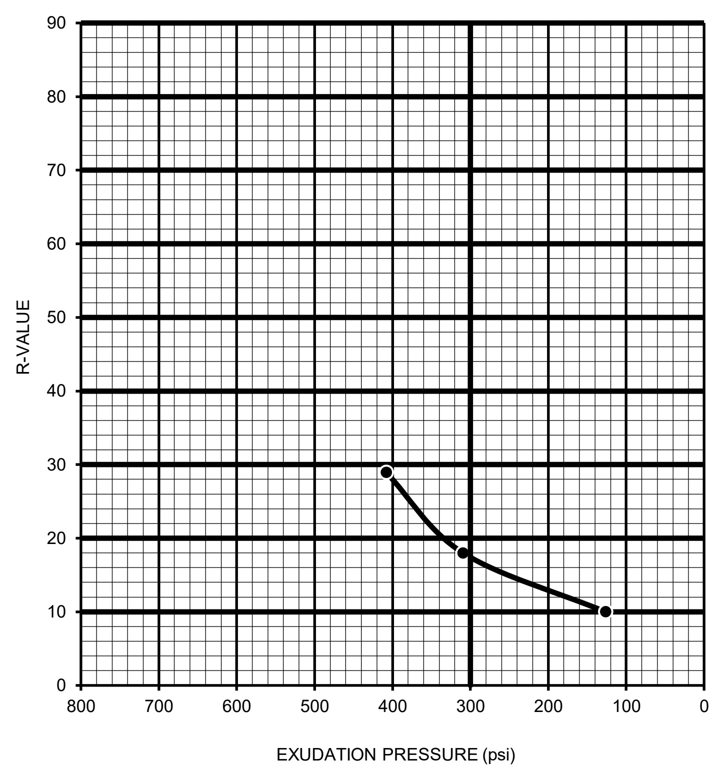
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	12.4	13.5	15.8
HEIGHT OF SAMPLE, Inches	2.53	2.52	2.55
DRY DENSITY, pcf	113.2	111.6	107.1
COMPACTOR AIR PRESSURE, psi	150	125	75
EXUDATION PRESSURE, psi	408	309	126
EXPANSION, Inches x 10exp-4	32	18	8
STABILITY Ph 2,000 lbs (160 psi)	95	115	134
TURNS DISPLACEMENT	4.20	4.48	4.56
R-VALUE UNCORRECTED	29	18	10
R-VALUE CORRECTED	29	18	10

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.14	1.31	1.44
EXPANSION PRESSURE THICKNESS, ft.	1.21	0.68	0.30

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	26
R-VALUE BY EXUDATION:	18
EQUILIBRIUM R-VALUE:	18

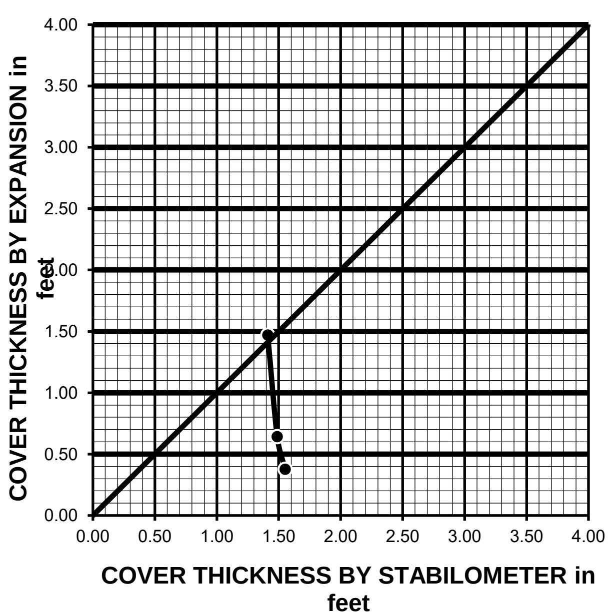
R-VALUE TEST RESULTS
ASTM D 2844

Project Name:	Diaz Rd Expansion	Date:	6/4/20
Project Number:	12502.001	Technician:	F. Mina
Boring Number:	LB-7	Depth (ft.):	0 - 5.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Lean Clay (CL), Black.		

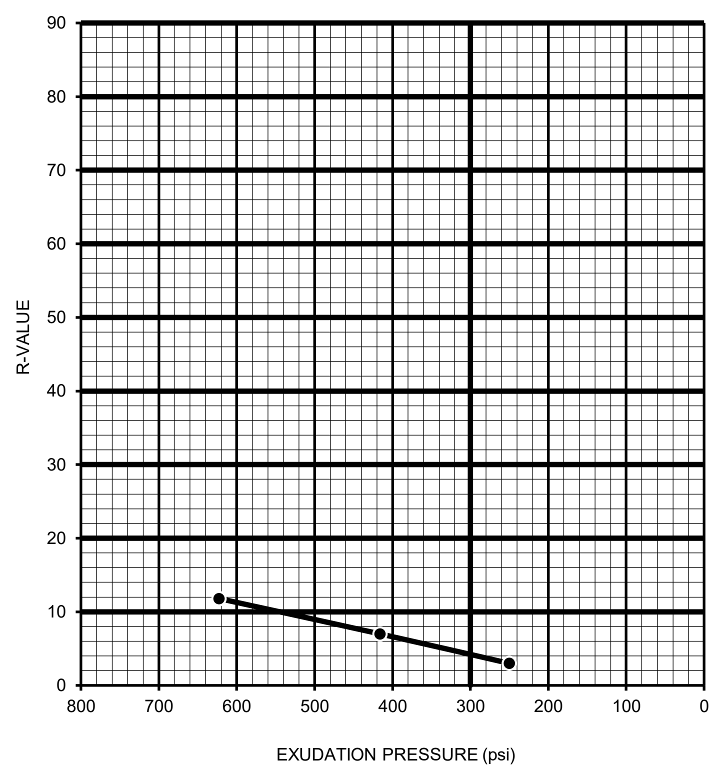
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	16.6	17.2	18.5
HEIGHT OF SAMPLE, Inches	2.55	2.48	2.55
DRY DENSITY, pcf	100.2	104.3	101.5
COMPACTOR AIR PRESSURE, psi	165	150	125
EXUDATION PRESSURE, psi	623	416	250
EXPANSION, Inches x 10exp-4	39	17	10
STABILITY Ph 2,000 lbs (160 psi)	130	141	150
TURNS DISPLACEMENT	4.31	4.61	4.87
R-VALUE UNCORRECTED	12	7	3
R-VALUE CORRECTED	12	7	3

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.41	1.49	1.55
EXPANSION PRESSURE THICKNESS, ft.	1.47	0.64	0.38

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	13
R-VALUE BY EXUDATION:	4
EQUILIBRIUM R-VALUE:	4

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS
ASTM D 6913

Leighton

Project Name:	Diaz Rd Expansion	Tested By:	FLM	Date:	06/01/20
Project No.:	12502.001	Checked By:	MRV	Date:	06/10/20
Boring No.:	LB-4	Depth (feet):	5.0 - 10.0		
Sample No.:	B-1				
Soil Identification:	Sandy Silt s(ML), Black				

		Moisture Content of Total Air - Dry Soil	
Container No.:	S	Wt. of Air-Dry Soil + Cont. (g)	800.7
Wt. of Air-Dried Soil + Cont.(g)	800.7	Wt. of Dry Soil + Cont. (g)	757.2
Wt. of Container (g)	421.0	Wt. of Container No.______ (g)	421.0
Dry Wt. of Soil (g)	336.2	Moisture Content (%)	12.9

After Wet Sieve	Container No.	S
	Wt. of Dry Soil + Container (g)	581.7
	Wt. of Container (g)	421.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	160.7

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
3"	75.000		100.0
1"	25.000		100.0
3/4"	19.000		100.0
1/2"	12.500		100.0
3/8"	9.500	0.0	100.0
#4	4.750	0.4	99.9
#8	2.360	3.9	98.8
#16	1.180	12.7	96.2
#30	0.600	29.1	91.3
#50	0.300	64.3	80.9
#100	0.150	112.0	66.7
#200	0.075	158.3	52.9
PAN			

GRAVEL: **0 %**

SAND: **47 %**

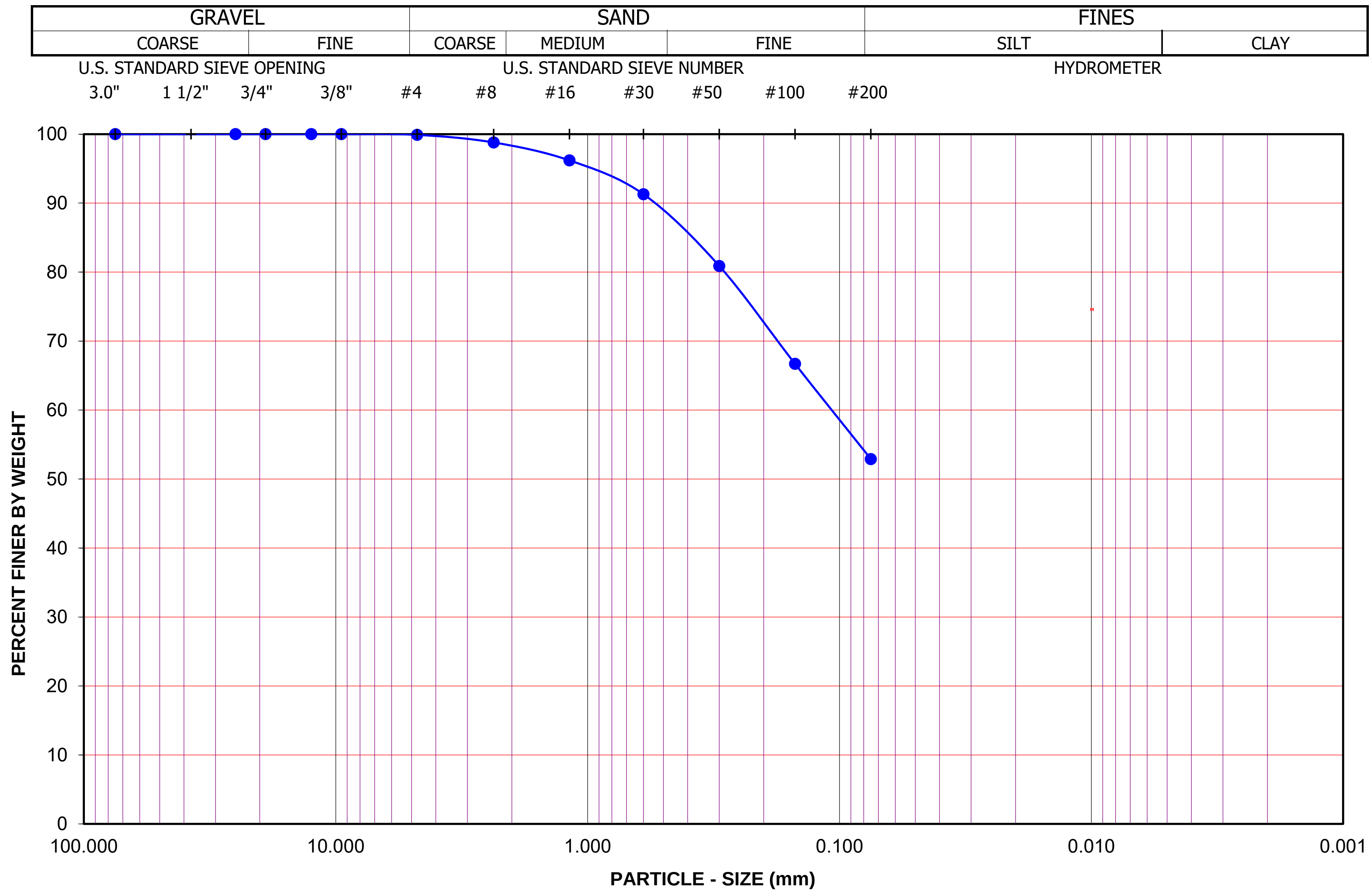
FINES: **53 %**

GROUP SYMBOL: **s(ML)**

$Cu = D60/D10 =$ N/A

$Cc = (D30)^2/(D60*D10) =$ N/A

Remarks:



Project Name: Diaz Rd Expansion

Project No.: 12502.001

Boring No.: LB-4 Sample No.: B-1

Depth (feet): 5.0 - 10.0 Soil Type : s(ML)

Soil Identification: Sandy Silt s(ML), Black

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 0 : 47 : 53

Jun-20

Sieve; LB-4, B-1 (05-15-20)

Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS
ASTM D 6913

Project Name:	Diaz Rd Expansion	Tested By:	FLM	Date:	06/01/20
Project No.:	12502.001	Checked By:	MRV	Date:	06/10/20
Boring No.:	LB-5	Depth (feet):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Sandy Silt s(ML), Dark Yellowish Brown.				

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	P	P	Wt. of Air-Dry Soil + Cont.(g)	2345.5	1037.5
Wt. Air-Dried Soil + Cont.(g)	2345.5	1037.5	Wt. of Dry Soil + Cont. (g)	2123.0	1037.5
Wt. of Container (g)	716.2	716.2	Wt. of Container No._____(g)	716.2	716.2
Dry Wt. of Soil (g)	1407.0	321.3	Moisture Content (%)	15.8	0.0

Passing #4 Material After Wet Sieve		
	Container No.	P
	Wt. of Dry Soil + Container (g)	875.8
	Wt. of Container (g)	716.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	159.6

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
1 1/2"	37.500			100.0
1"	25.000			100.0
3/4"	19.000	0.0		100.0
1/2"	12.500	16.4		98.8
3/8"	9.500	18.7		98.7
#4	4.750	48.5		96.6
#8	2.360		9.5	93.7
#16	1.180		20.8	90.3
#30	0.600		35.6	85.9
#50	0.300		59.7	78.7
#100	0.150		103.7	65.4
#200	0.075		158.3	49.0
PAN				

GRAVEL: **3 %**

SAND: **48 %**

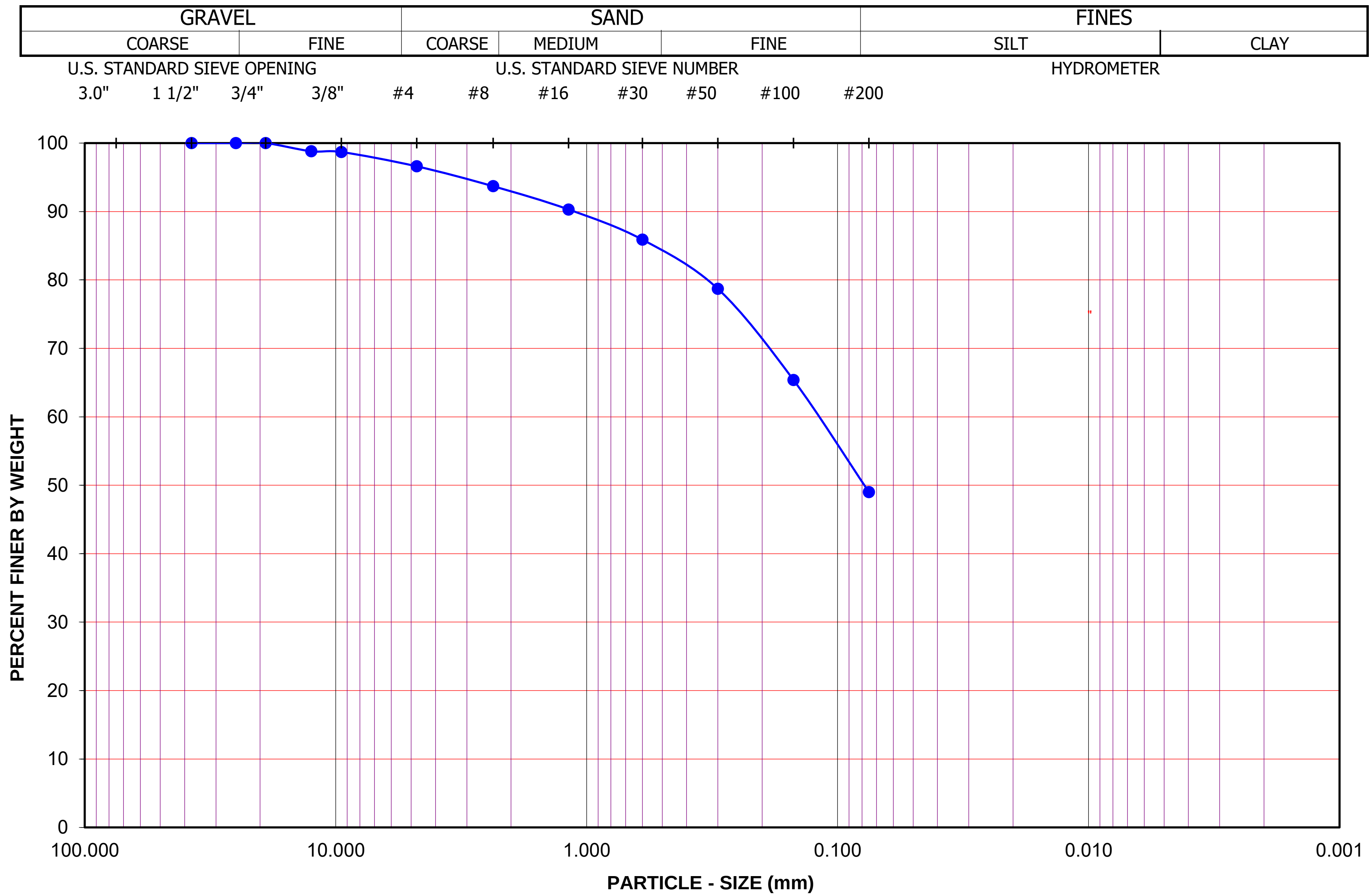
FINES: **49 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = N/A

Cc = (D30)²/(D60*D10) = N/A

Remarks:



Project Name: Diaz Rd Expansion

Project No.: 12502.001

Boring No.: LB-5 Sample No.: B-1

Depth (feet): 0 - 5.0 Soil Type : SM

Soil Identification: Sandy Silt s(ML), Dark Yellowish Brown.

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 3 : 48 : 49

Jun-20

Sieve; LB-5, B-1 (05-15-20)

ATTERBERG LIMITS
ASTM D 4318

Leighton

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	6/4/20
Project No. :	12502.001	Input By:	M. Vinet	Date:	6/10/20
Boring No.:	LB-2	Checked By:	M. Vinet	Date:	6/10/20
Sample No.:	B-1	Depth (ft.)	5.0 - 10.0		

Sample Description: Lean Clay with Sand (CL)s, Dark Yellowish Brown.

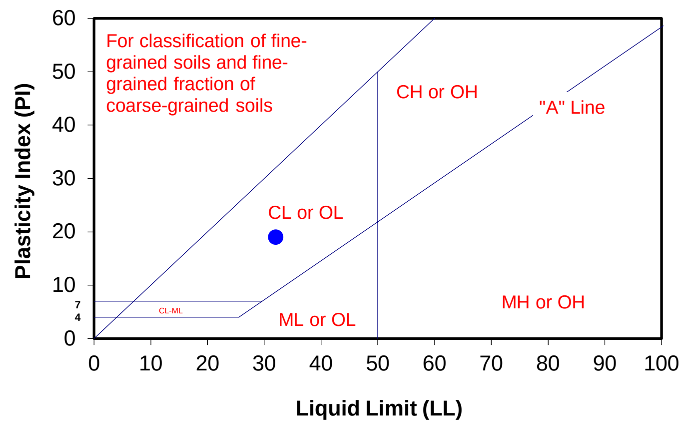
	PLASTIC LIMIT		LIQUID LIMIT			**IN-SITU
TEST NO.	1	2	1	2	3	MOISTURE
Number of Blows [N]			15	25	35	
Wet Wt. of Soil + Cont. (gm)	21.61	21.76	20.19	20.45	20.75	
Dry Wt. of Soil + Cont. (gm)	20.70	20.82	18.58	18.82	19.08	
Wt. of Container (gm)	13.63	13.79	13.75	13.66	13.67	
Moisture Content (%) [Wn]	12.9	13.4	33.3	31.6	30.9	

Liquid Limit	**32**
Plastic Limit	**13**
Plasticity Index	**19**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 8.76

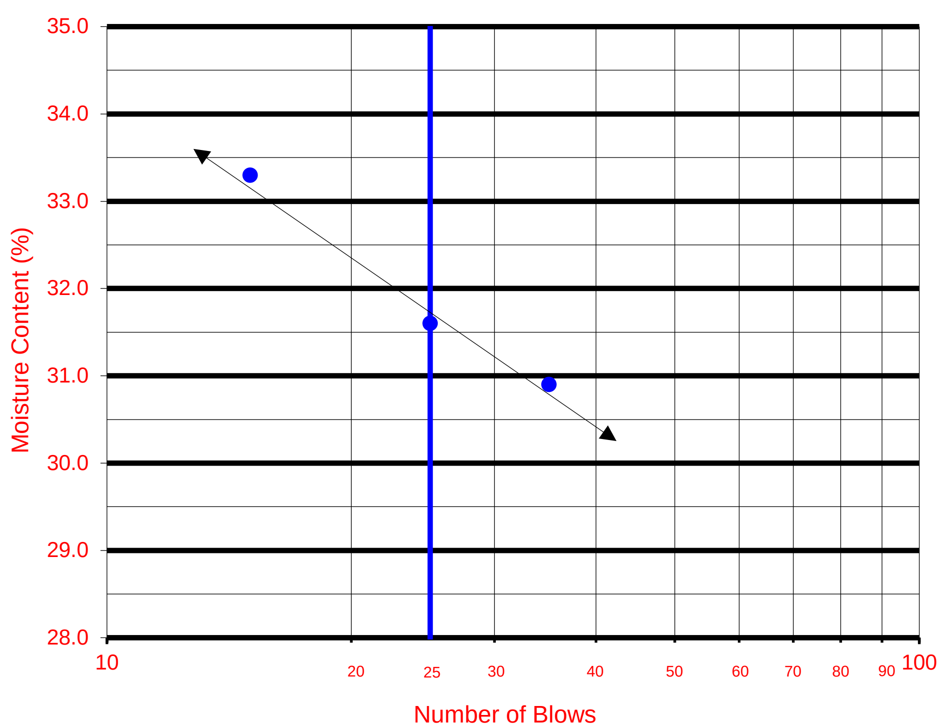
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation — Multipoint - Wet
- [x] Dry Preparation — Multipoint - Dry
- [x] Procedure A — Multipoint Test
- [ ] Procedure B — One-point Test



Rev. 08-04

ATTERBERG LIMITS

ASTM D 4318

Leighton

Project Name:	Diaz Rd Expansion	Tested By:	F. Mina	Date:	6/4/20
Project No. :	12502.001	Input By:	M. Vinet	Date:	6/10/20
Boring No.:	LB-7	Checked By:	M. Vinet	Date:	6/10/20
Sample No.:	B-1	Depth (ft.)	0 - 5.0		
Sample Description:	Lean Clay (CL), Black.				

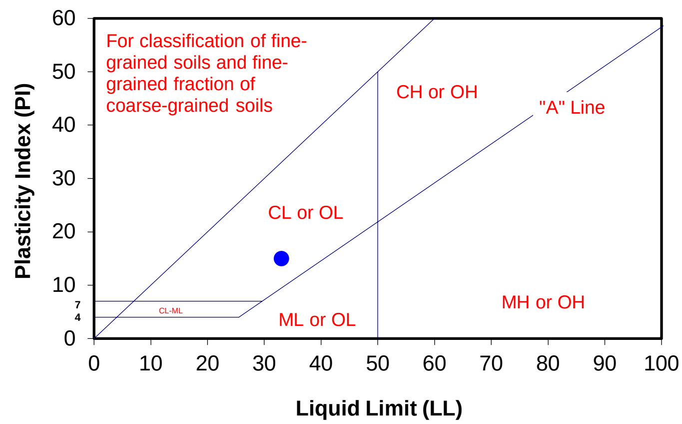
	PLASTIC LIMIT		LIQUID LIMIT			**IN-SITU
TEST NO.	1	2	1	2	3	MOISTURE
Number of Blows [N]			15	25	35	
Wet Wt. of Soil + Cont. (gm)	23.85	23.41	20.95	22.50	21.12	
Dry Wt. of Soil + Cont. (gm)	22.33	21.94	19.17	20.33	19.36	
Wt. of Container (gm)	13.78	13.71	13.95	13.77	13.85	
Moisture Content (%) [Wn]	17.8	17.9	34.1	33.1	31.9	

Liquid Limit	**33**
Plastic Limit	**18**
Plasticity Index	**15**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) = 9.49

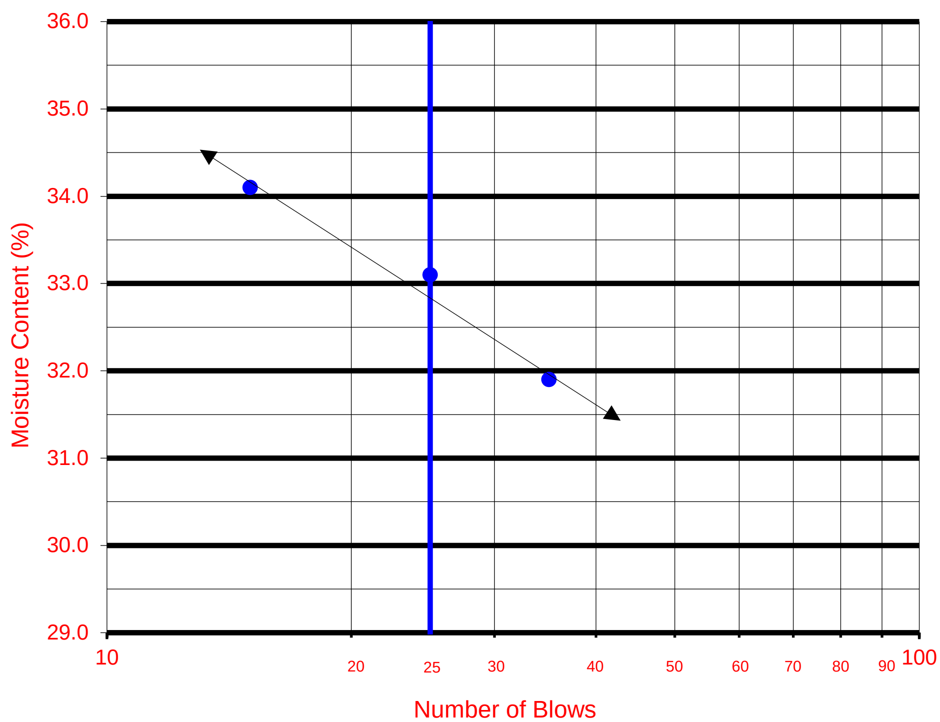
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Rev. 08-04

Leighton

TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Project Name: Diaz Rd Expansion | Tested By : F. Mina | Date: 06/04/20

Project No. : 12502.001 | Data Input By: M. Vinet | Date: 06/10/20

Boring No.	LB-7			
Sample No.	B-1			
Sample Depth (ft)	0 - 5.0			
Soil Identification:	CL			
Wet Weight of Soil + Container (g)	100.00			
Dry Weight of Soil + Container (g)	100.00			
Weight of Container (g)	0.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.00			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	4			
Crucible No.	4			
Furnace Temperature (°C)	850			
Time In / Time Out	Timer			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	24.8569			
Wt. of Crucible (g)	24.8502			
Wt. of Residue (g) (A)	0.0067			
PPM of Sulfate (A) x 41150	275.70			
PPM of Sulfate, Dry Weight Basis	**276**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	2.2			
PPM of Chloride (C -0.2) * 100 * 30 / B	200			
PPM of Chloride, Dry Wt. Basis	**200**			

pH TEST, DOT California Test 643

pH Value	**8.50**			
Temperature °C	21.0			

Leighton

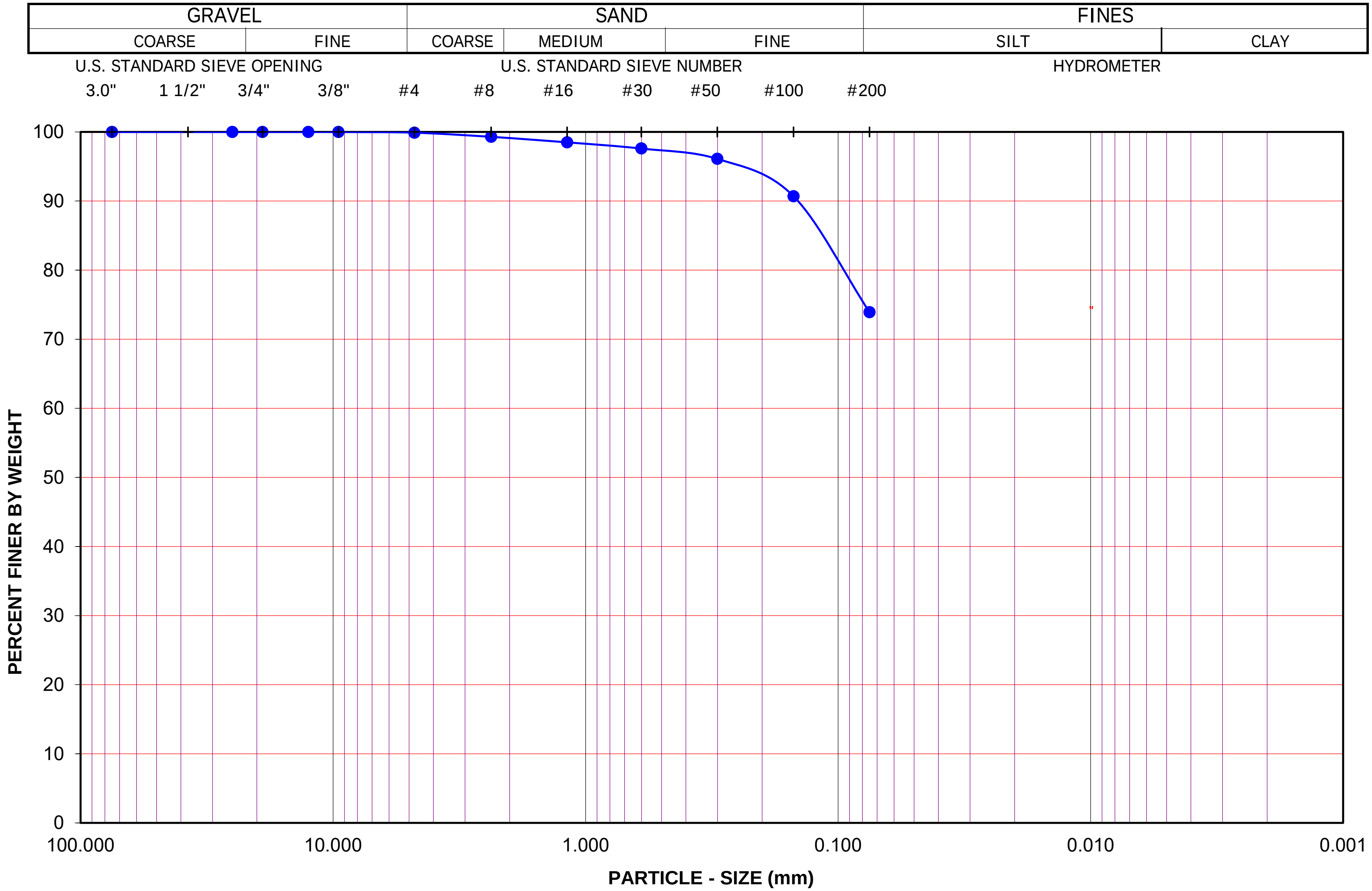
TESTS for SULFATE CONTENT

Project Name:	Diaz Rd Expansion	Tested By :	F. Mina	Date:	06/04/20
Project No. :	12502.001	Data Input By:	M. Vinet	Date:	06/10/20

Boring No.	LB-2	LB-4		
Sample No.	B-1	B-1		
Sample Depth (ft)	5.0 - 10.0	0 - 5.0		
Soil Identification:	(CL)s	s(ML)		
Wet Weight of Soil + Container (g)	100.00	100.00		
Dry Weight of Soil + Container (g)	100.00	100.00		
Weight of Container (g)	0.00	0.00		
Moisture Content (%)	0.00	0.00		
Weight of Soaked Soil (g)	100.00	100.00		

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	1	2		
Crucible No.	1	2		
Furnace Temperature (°C)	850	850		
Time In / Time Out	Timer	Timer		
Duration of Combustion (min)	45	45		
Wt. of Crucible + Residue (g)	26.1035	24.4732		
Wt. of Crucible (g)	26.0942	24.4667		
Wt. of Residue (g) (A)	0.0093	0.0065		
PPM of Sulfate (A) x 41150	382.69	267.47		
PPM of Sulfate, Dry Weight Basis	**383**	**267**		



Project Name: KJ/EMWD TVRW Pipeline

Project No.: 10807.002

Exploration No.: LB-9

Sample No.: R-1

Depth (feet): 5.0

Soil Type : (ML)s

Soil Identification: Silt with Sand (ML)s, brown.

GR:SA:FI : (%) **0 : 26 : 74**

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Feb-16

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	KJ/EMWD TVRW Pipeline Geo Exploration	Tested By:	MRV	Date:	10/7/14
Project No. :	10807.001	Checked By:	JHW	Date:	10/9/14
Boring No.:	LB-9	Depth (ft.)	7.5		
Sample No. :	R-2/B-1	Location:	**		
Sample Description:	Silt with Trace Gravel (ML), dark brown.				

Dry Wt. of Soil + Cont. (gm.)	980.6
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	980.6
Weight Soil Retained on #4 Sieve	2.5
Percent Passing # 4	99.7

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0430
Wt. Comp. Soil + Mold (gm.)	595.4	634.6
Wt. of Mold (gm.)	200.6	200.6
Specific Gravity (Assumed)	2.70	2.70
Container No.	5	5
Wet Wt. of Soil + Cont. (gm.)	339.3	634.6
Dry Wt. of Soil + Cont. (gm.)	309.6	355.7
Wt. of Container (gm.)	39.3	200.6
Moisture Content (%)	11.0	22.0
Wet Density (pcf)	119.1	130.7
Dry Density (pcf)	107.3	107.1
Void Ratio	0.571	0.639
Total Porosity	0.364	0.390
Pore Volume (cc)	75.3	84.2
Degree of Saturation (%) [S meas]	**52.0**	**93.1**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
10/7/14	14:40	1.0	0	0.5000
10/7/14	14:50	1.0	10	0.4996
	Add Distilled Water to the Specimen			
10/8/14	5:30	1.0	880	0.5430
10/8/14	6:30	1.0	940	0.5430

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	43.4
Expansion Index (Report) =	Nearest Whole Number or Zero (0) if Initial Height is > than Final Height	**43**

Rev. 03-08

Leighton

SAND EQUIVALENT TEST

ASTM D 2419 / DOT CA Test 217

Project Name:	KJ/EMWD TVRW Pipeline Geo Exploration	Tested By:	FLM	Date:	9/25/14
Project No. :	10807.001	Computed By:	FLM	Date:	9/25/14
Client:	Kennedy/Jenks Consultants, Inc.	Checked By:	JHW	Date:	10/9/14

Boring No.	Sample No.	Depth (ft.)	Soil Description	T1	T2	T3	T4	R1	R2	SE	Average SE
LB-8	B-1	5.0 - 10.0	SC	11:50	12:00	12:02	12:22	13.6	1.0	8	**9**
				11:52	12:02	12:04	12:24	13.4	1.2	9	

T1 = Starting Time

T2 = (T1 + 10 min) Begin Agitation

T3 = Settlement Starting Time

T4 = (T3 + 20 min) Take Clay Reading (R1)

Sand Equivalent = R2 / R1 * 100

Record SE as Next Higher Integer

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

Leighton

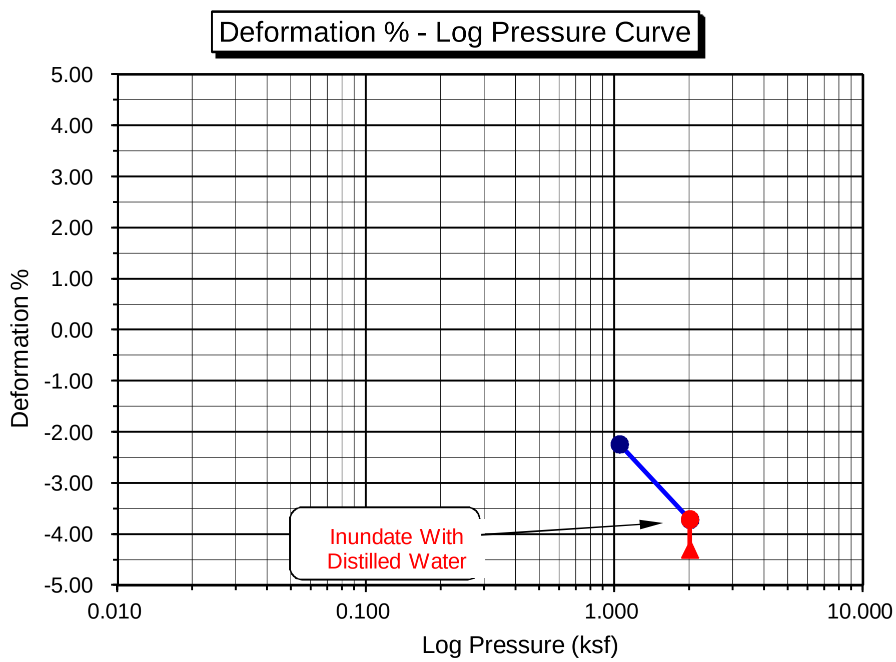
Project Name: KJ/EMWD TVRW Pipeline Geo Exploration   Tested By: MRV   Date: 10/6/14
Project No.: 10807.001   Checked By: JHW   Date: 10/9/14
Boring No.: **LB-8**   Sample Type: IN SITU
Sample No.: **R-2**   Depth (ft.) 10.0
Sample Description: Silty Clay (CL-ML), dark brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	99.3
Initial Moisture (%):	25.5
Initial Height (in.):	0.9970
Initial Dial Reading (in):	0.0500
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	104.4
Final Moisture (%) :	23.8
Initial Void ratio:	0.6968
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	98.7

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0753	0.9747	0.00	-2.24	0.6589	-2.24
2.013	0.0900	0.9600	0.00	-3.71	0.6339	-3.71
H2O	0.0958	0.9542	0.00	-4.29	0.6240	-4.29

Percent Swell / Settlement After Inundation = -0.60



Rev. 01-10

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Leighton

Project Name: KJ/EMWD TVRW Pipeline Geo Exploration
Project No. : 10807.001
Boring No.: LB-8
Sample No. : B-1
Soil Identification:* SC, dark brown

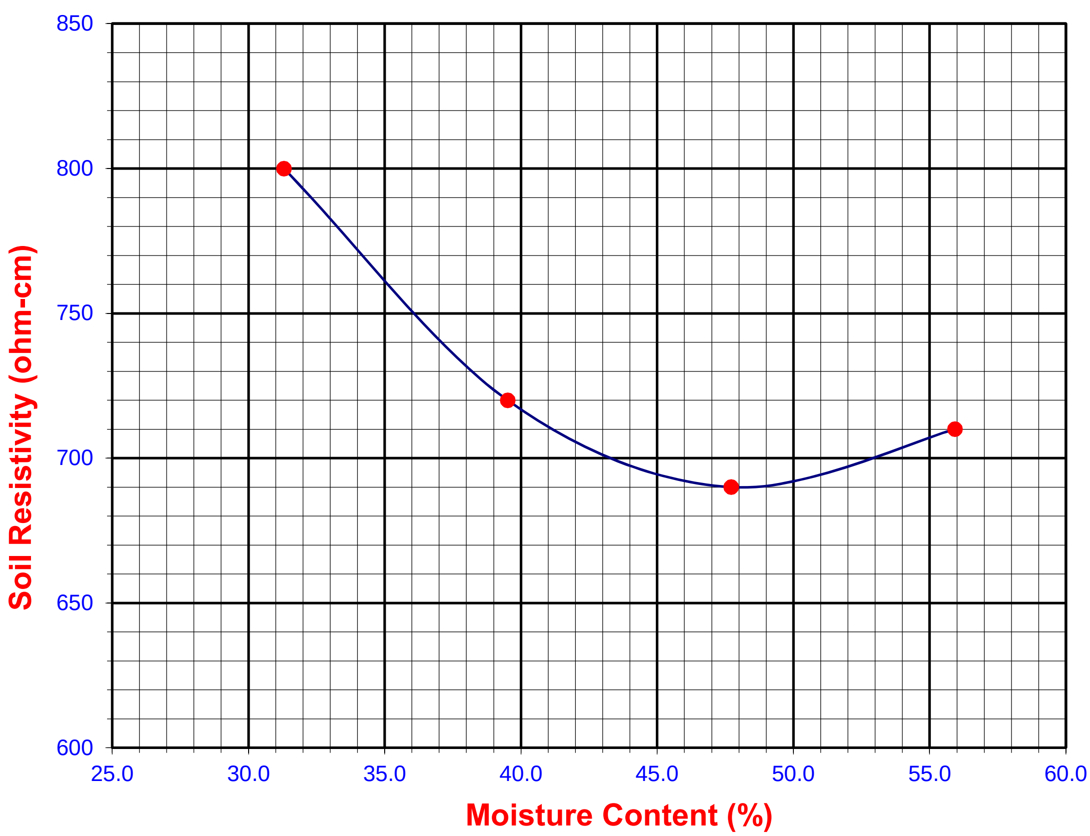
Tested By : G. Berdy Date: 10/06/14
Data Input By: J. Ward Date: 10/07/14
Depth (ft.) : 5-10

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	31.31	800	800
2	40	39.51	720	720
3	50	47.72	690	690
4	60	55.93	710	710
5				

Moisture Content (%) (MCi)	6.69
Wet Wt. of Soil + Cont. (g)	225.45
Dry Wt. of Soil + Cont. (g)	214.65
Wt. of Container (g)	53.14
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
690	**48.1**	**529**	**182**	**8.00**	**22.2**

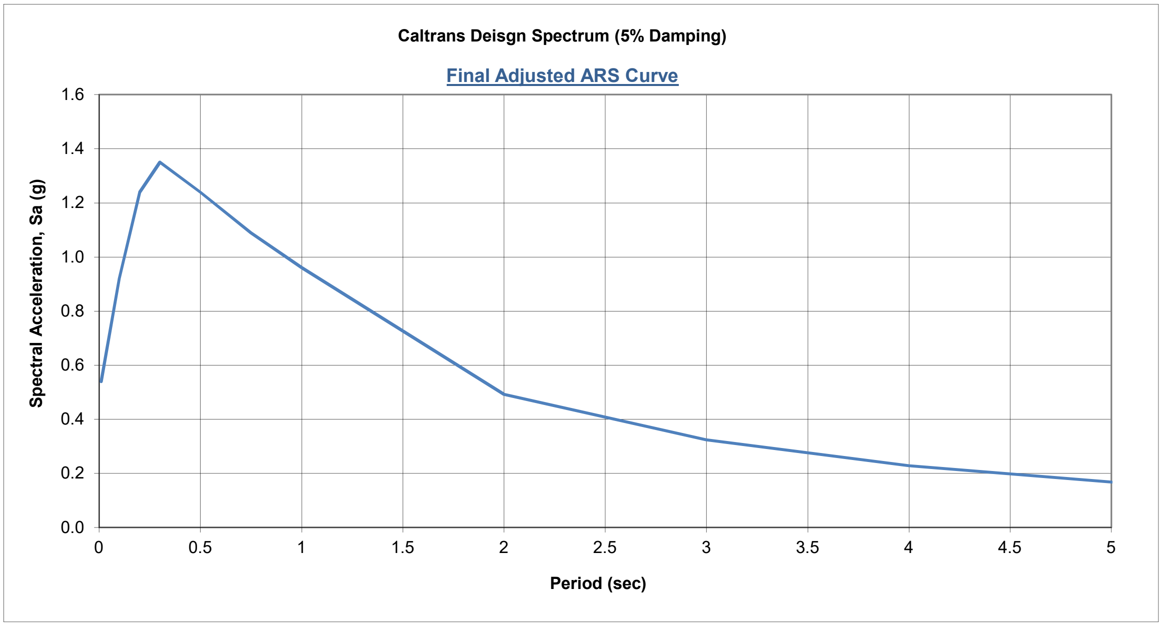


APPENDIX C

ARS Curves and Percolation Testing Data Sheets

ARS Curve per Caltrans Seismic Design Criteria (SDC) V2.0

975-year return period (5% probability of exceedance in 50 years)



ARS Online Probabilistic Data V3.0.1 per Caltrans SDC V2.0.				
T (sec)	**Base Spectrum S(a)**	**Basin Factor**	**Near Fault Factor**	**Final Adj. Spectrum S(a)**
0.01	0.54	1	1	**0.54**
0.1	0.92	1	1	**0.92**
0.2	1.24	1	1	**1.24**
0.3	1.35	1	1	**1.35**
0.5	1.24	1	1	**1.24**
0.75	0.99	1	1.1	**1.09**
1	0.8	1	1.2	**0.96**
2	0.41	1	1.2	**0.49**
3	0.27	1	1.2	**0.32**
4	0.19	1	1.2	**0.23**
5	0.14	1	1.2	**0.17**

Comparison of the 2014 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data			
Period (sec)	INPUT USGS Deagg. Spec Accel	ARS Online Base Sa(g)	% Difference (bet. USGS & ARS Online)
0	0.53	0.54	1.9%
0.3	1.34	1.35	0.7%
1	0.81	0.80	1.3%
3	0.28	0.27	3.7%

Max % Difference = **3.7%**

Project Data:

Lattitude: 33.5139
Longitude: -117.1658
Shear Wave Velocity Vs = 270 m/s

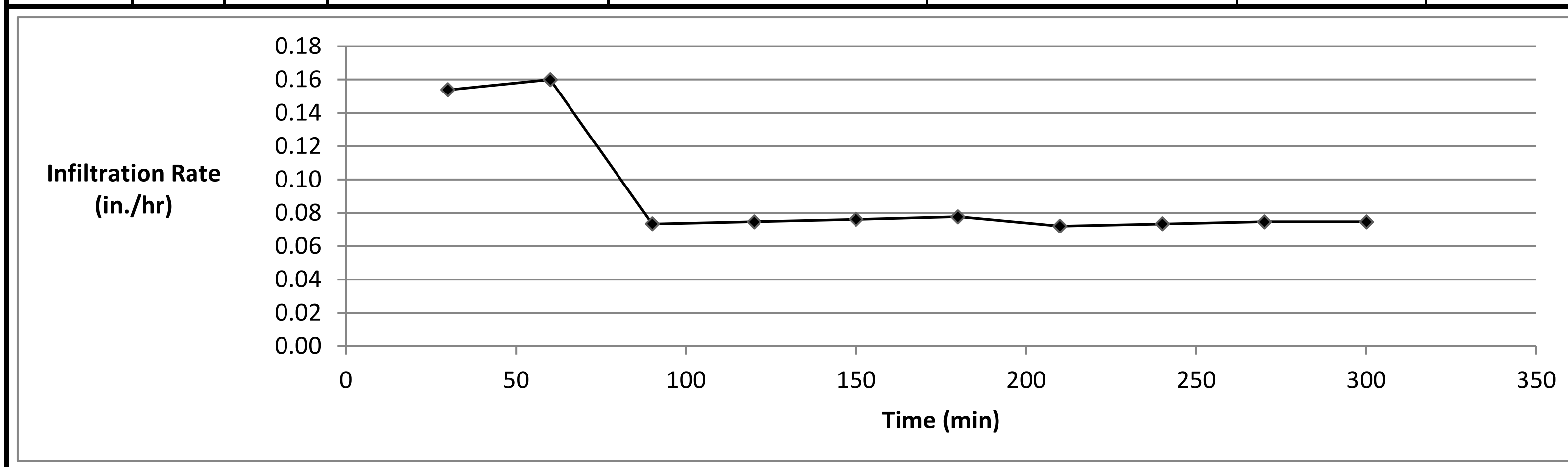
Peak Ground Accelaration = 0.54 g

Proj: 12324.001	Prepared by: BSS Checked By: SIS	Design Accelaration Response Spectrum **Diaz Road Expansion Project (PW17-25** **Temecula, California**	**Figure C-1**
Scale: NTS	Date: 05/2020		Leighton

References
https://arsonline.dot.ca.gov/
Caltrans SDC V2.0 (April 2019)

Test Hole Number:	P-1	Project	Diaz Road	
Date Excavated:	5/15/2020	Project Number	12502.001	
Tested by:	JTD	Date Tested	5/19/2020	
Soil Unit:	Artificial Fill	Depth of Test Hole (in.)	60	75 °
USCS Soil Type:	Sandy Lean CLAY	Diameter (in.)	8	Effective Radius (in) 4

Time	Δt (min)	Total Time (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration Rate* (inches/hour)	Peroclation Rate (minute/inch)
7:33:00 8:03:00	30	30	35.50	36.50	1.00	0.15	30.0
8:03:00 8:33:00	30	60	36.50	37.50	1.00	0.16	30.0
8:33:00 9:03:00	30	90	34.50	35.00	0.50	0.07	60.0
9:03:00 9:33:00	30	120	35.00	35.50	0.50	0.07	60.0
9:33:00 10:03:00	30	150	35.50	36.00	0.50	0.08	60.0
10:03:00 10:33:00	30	180	36.00	36.50	0.50	0.08	60.0
10:33:00 11:03:00	30	210	34.00	34.50	0.50	0.07	60.0
11:03:00 11:33:00	30	240	34.50	35.00	0.50	0.07	60.0
11:33:00 12:03:00	30	270	35.00	35.50	0.50	0.07	60.0
12:03:00 12:33:00	30	300	35.00	35.50	0.50	0.07	60.0

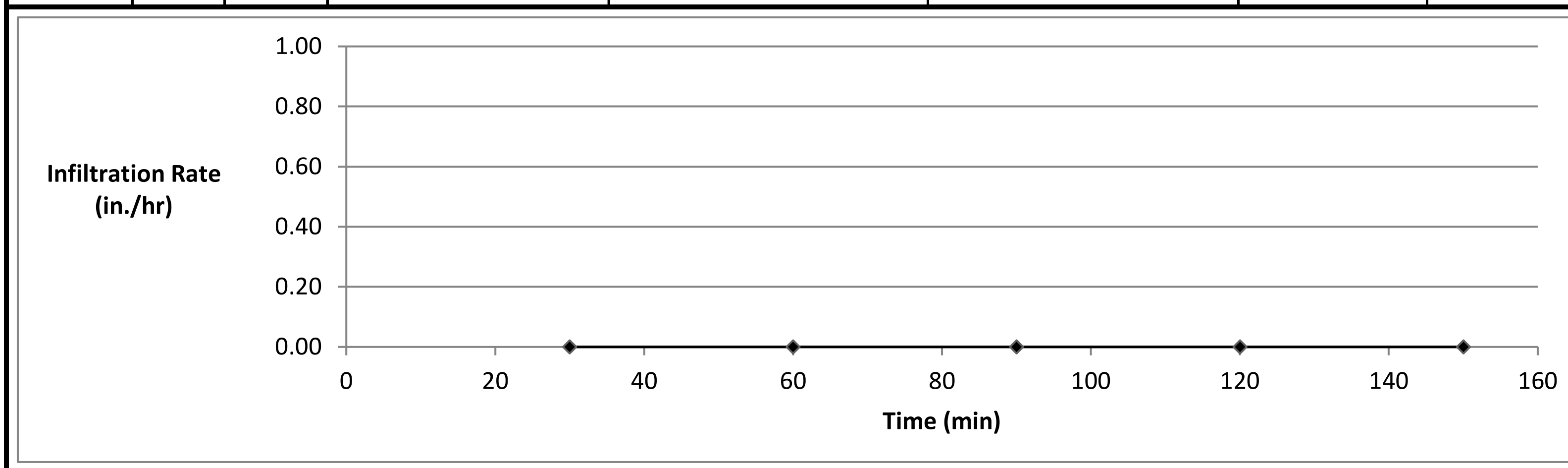


* Based on Porchet Method

Percolation Test Data	***Project Number:***	12502.001	
P- 1	***Project Name:***	*Diaz Road*	Leighton
	Date:	May-20	

Test Hole Number:	P-2	Project	Diaz Road	
Date Excavated:	5/15/2020	Project Number	12502.001	
Tested by:	JTD	Date Tested	5/19/2020	
Soil Unit:	Artificial Fill	Depth of Test Hole (in.)	60	75 °
USCS Soil Type:	Clayey SAND	Diameter (in.)	8	Effective Radius (in) 4

Time	Δt (min)	Total Time (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration Rate* (inches/hour)	Peroclation Rate (minute/inch)
7:36:00 8:06:00	30	30	28.00	28.00	0.00	0.00	N/A
8:06:00 8:36:00	30	60	28.00	28.00	0.00	0.00	N/A
8:36:00 9:06:00	30	90	28.00	28.00	0.00	0.00	N/A
9:06:00 9:36:00	30	120	28.00	28.00	0.00	0.00	N/A
9:36:00 10:06:00	30	150	28.00	28.00	0.00	0.00	N/A
						End Of Test	

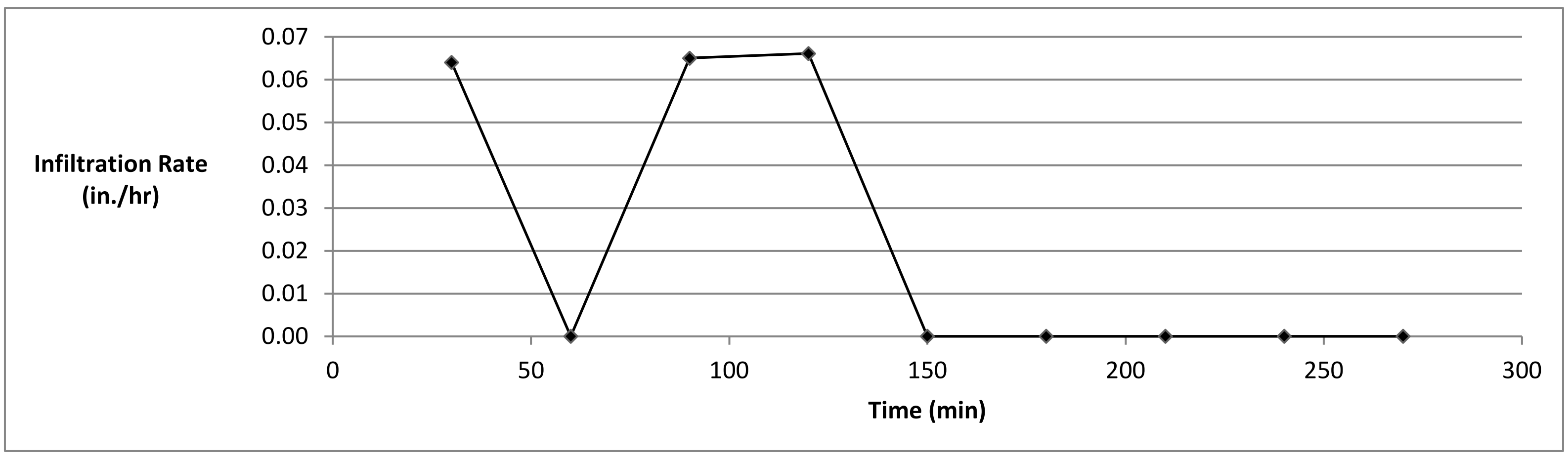


* Based on Porchet Method

Percolation Test Data P-2	***Project Number:*** 12502.001 ***Project Name:*** *Diaz Road* ***Date:*** May-20	Leighton

Test Hole Number:	P-3	Project	Diaz Road	
Date Excavated:	5/15/2020	Project Number	12502.001	
Tested by:	JTD	Date Tested	5/19/2020	
Soil Unit:	Artificial Fill	Depth of Test Hole (in.)	60	75 °
USCS Soil Type:	Clayey SAND	Diameter (in.)	8	Effective Radius (in) 4

Time	Δt (min)	Total Time (min)	Initial Water Depth (inches)	Final Water Depth (inches)	Change In Water Level (inches)	Infiltration Rate* (inches/hour)	Peroclation Rate (minute/inch)
7:41:00 8:11:00	30	30	30.50	31.00	0.50	0.06	60.0
8:11:00 8:41:00	30	60	31.00	31.00	0.00	0.00	N/A
8:41:00 9:11:00	30	90	31.00	31.50	0.50	0.07	60.0
9:11:00 9:41:00	30	120	31.50	32.00	0.50	0.07	60.0
9:41:00 10:11:00	30	150	32.00	32.00	0.00	0.00	N/A
10:11:00 10:41:00	30	180	32.00	32.00	0.00	0.00	N/A
10:41:00 11:11:00	30	210	32.00	32.00	0.00	0.00	N/A
11:11:00 11:41:00	30	240	32.00	32.00	0.00	0.00	N/A
11:41:00 12:11:00	30	270	32.00	32.00	0.00	0.00	N/A
						End Of Test	



* Based on Porchet Method

Percolation Test Data **P-3**	***Project Number:*** 12502.001 ***Project Name:*** *Diaz Road* ***Date:*** May-20	Leighton

APPENDIX D

General Earthwork and Grading Specifications

APPENDIX D

LEIGHTON CONSULTING, INC.
EARTHWORK AND GRADING GUIDE SPECIFICATIONS

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D-1.0 GENERAL

D-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

D-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

D-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide

Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

D-2.0 PREPARATION OF AREAS TO BE FILLED

D-2.1 **Clearing and Grubbing**

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

D-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be over-excavated as specified in the following Section D-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

D-2.3 Overexcavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

D-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

D-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

D-3.0 FILL MATERIAL

D-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

D-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

D-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section D-3.1, and be free of hazardous materials ("contaminants") and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than (≤) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

D-4.0 FILL PLACEMENT AND COMPACTION

D-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section D-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

D-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

D-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, each layer shall be uniformly compacted to not-less-than (≥) 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. In some cases, structural fill may be specified (see project-specific geotechnical report) to be uniformly compacted to at-least (≥) 95 percent of the ASTM D 1557 modified Proctor laboratory maximum dry density. For fills thicker than (>) 15 feet (4.5 m), the portion of fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

D-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by back rolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

D-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

D-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton

Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

D-5.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, then observed and reviewed by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

D-6.0 TRENCH BACKFILLS

D-6.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2009 Edition or more current (see also: http://www.dir.ca.gov/title8/sb4a6.html).

D-6.2 Bedding and Backfill

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise, the pipe-bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

D-6.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

APPENDIX E

GBA-Important Information about This Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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